

A CAHNIERS PUBLICATION

DATA MATION

FOR EDITORS, SOME NEW PROFESSIONALS WORLDWIDE

Gerald D. Cohen (right), president,
John Senor (left), EDA/SQL director,
Information Builders Inc.,
with an EDA/SQL database model

NOVEMBER 1, 1991

Universal Database Access! page 30

*Make Way For
Modular PCs page 43*

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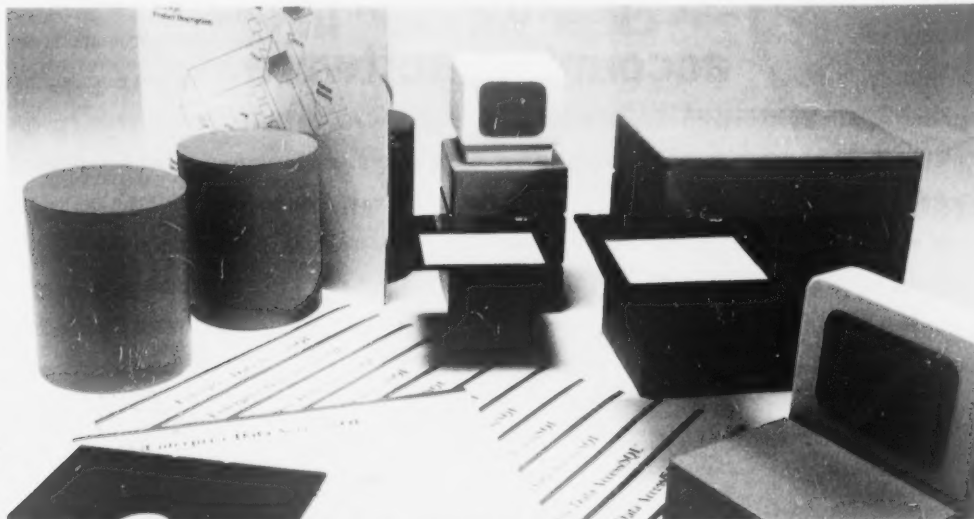
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DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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Essentially, EDA/SQL is a set of five basic software building blocks: API/SQL, EDA/SQL Extenders, EDA/SQL Server, EDA/Data Drivers and EDA/Link.

COVER STORY

CONNECTIVITY

Universal Database Access!

30

BY MIKE RICCIUTI Information Builders's new Enterprise Data Access product lets you find, retrieve, join and update data on any database—DB2, Oracle, Rdb, dBase, even MUMPS—located on any hardware platform.

Cover photography by Kenneth Collins

PCs & WORKSTATIONS

UPGRADE OPTIONS

Make Way For Modular PCs

43

BY BOB FRANCIS As budget-minded PC managers try to squeeze the most from their PC dollars, vendors are scrambling to deliver a variety of upgradable products. But everyone may not need a modular PC.

PRODUCT GUIDE

FEATURE

A Database Publishing Recipe

83

BY SARAH H. LINDSEY Ventura Database Publisher provides a way to pull information from your database into your desktop-publishing software.

Ventura's Kennedy cooks up a way to automate the publishing process.



FEATURES

PCs & WORKSTATIONS

DISKLESS WORKSTATIONS

Diskless Workstations Slim Down 48

BY RICK COOK The still-sleepy diskless workstation market is trying to wake itself up with compact new models that leave more space on the desktop. But users may still not want them—no matter what the size.

NETWORKS

WIDE AREA

Frame Relay Goes Public 53

BY NANCY KORPI AND STEVEN TAYLOR If increasing LAN traffic and other high-bandwidth applications are straining your wide-area network, public frame-relay services offer a cost-effective boost.

APPLETALK

AppleTalk Due For Routing Relief 58

BY SHARON FISHER Extensive internetworking of AppleTalk is hampered by a routing protocol that generates too much overhead. Apple is moving toward a leaner, meaner routing scheme.

SOFTWARE

TRANSACTION PROCESSING

IBM Puts New Muscle Into CICS 62

BY JEFF MOAD Still waiting for IBM to get its CICS together? The new enhancements to version 3 of the Customer Information Control System transaction processor for ESA is a big jump in the right direction.



Candle's Hunt is encouraged by IBM's commitment.

SYSTEMS

DATA CENTERS

Clients, Servers And The Glass House 72

BY DWIGHT B. DAVIS What more unlikely candidate for consolidating servers in a glass house might there be than Microsoft Corp.? And yet the PC software leader is doing just that.

INTERNATIONAL

Special supplement, not available in all issue, 80-1



The world's leading producer of personal computer software operates a glass house IS shop with a \$60 million yearly budget, page 72



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Software

A Cure For The
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NEW PRODUCTS

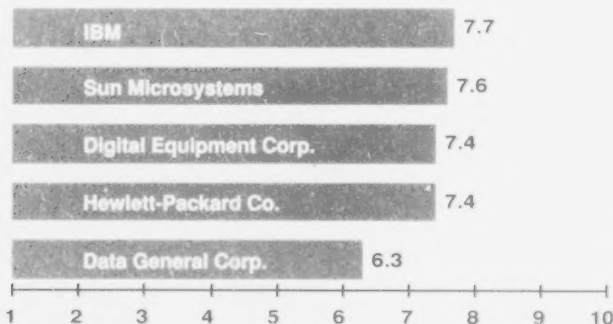
A SELECTION OF RECENT INTRODUCTIONS



Corporate Satisfaction Scorecard: RISC Workstations

DATAMATION surveyed IS managers who have purchased RISC workstations to determine their level of satisfaction.

(1=Not Satisfied, 10=Most Satisfied)



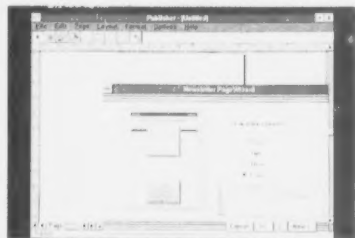
Source: DATAMATION, June 1991

► SOFTWARE

Publisher for Windows

If PageMaker or Ventura Publisher just aren't for you, there's a new desktop-publishing package on the market.

Microsoft Publisher runs under Windows 3.0 and is designed for those who have little or no experience with computers or graphic design. A feature called PageWizards is meant to automate the design process; users select options from a menu, and the software constructs the design. PageWizards walks the users through the creation of 12 different



MICROSOFT PUBLISHER provides design tips, describing the strengths and weaknesses of a user's layout

types of document, including newsletters, invoices and expense reports.

Microsoft Publisher includes a built-in word processor text, and it can import text from most popular word processors, including Microsoft Word, Microsoft Works, WordPerfect and WordStar. Microsoft Publisher uses the standard Windows fonts and includes a library of more than 100 clip art images. The \$199 package requires Windows, DOS 3.1 or later, EGA graphics and 1 megabyte of random access memory, although Microsoft recommends 2MB. MICROSOFT CORP., Redmond, Wash.

Circle 525

Memory Management

Memory may be cheap these days, but RAM cram hasn't gone away. Quarterdeck Office Systems Inc. has enhanced its QEMM-386 memory management and processor control system to ensure that every bit of memory is put to good use.

QEMM-386 6.0 allows user-configured management of all of a PC's memory: conventional, expanded, extended and high. The software automatically configures

memory and loads terminate-and-stay-resident (TSR) programs and device drivers in high memory. It supports the suspend and resume feature used on laptops and has read only memory (ROM) detection and utilization capabilities that can free up to 115 kilobytes of high memory. It can also squeeze out 8 to 24KB more memory for people who use Windows 3.0 in enhanced mode. QEMM-386 retails for \$99.95. QUARTERDECK OFFICE SYSTEMS INC., Santa Monica, Calif.

Circle 526

Virus Protection For The Network

IS managers who are worried their PCs might catch a virus might consider looking at Central Point Software Inc.'s Anti-Virus 1.1. The enhanced software now recognizes more viruses, requires less memory and provides greater network support than its previous incarnation.

Among the 200 new viruses that Anti-Virus detects are the Tequila, Michelangelo and Diamond viruses. Version 1.1 also supports expanded and extended memory, reducing the amount of conventional memory required by the optional memory-resident virus detection programs vSAFE and vWATCH. Version 1.1 can be configured to alert the LAN administrator when it detects a virus on a networked PC.

Anti-Virus lists for \$129. A single update is \$20, and IS managers who are especially nervous about new viruses can sign up for Central Point's new \$59 Virus Protection Subscription Plan, which provides quarterly releases of the software. CENTRAL POINT SOFTWARE INC., Beaverton, Ore.

Circle 527

► PCs & WORKSTATIONS

The Future Is Here

The Future notebook computer from ISE Electronics Inc. uses data compression technology to provide 120 mega-

MARKET INSIGHTS

AN ANALYSIS OF ECONOMIC TRENDS

Global Upheaval Stalled Recovery

BY MADFLINE FRANCHI

Cahners Economics

Ask an economist what the future holds, and she may answer like this: "All things held constant, I expect the economy next year to be..." and then go on with her forecast. Last year, when we predicted that a modest increase was coming for the information technology industry this year, that's what we were expecting—that excluding economic factors most other things would be constant.

But *constant* is not a word that could easily be applied to the past 12 months. The breakup of the East Bloc of the Soviet empire, the Gulf War and now the breakup of the Soviet Union itself have all contributed to creating a high level of uncertainty in the international economy. As a result, the economic turnaround we had forecast for mid-1991 stalled, and it continues to stall. Unsold inventories of computer manufacturers are rising and hours worked by computer industry employees are down.

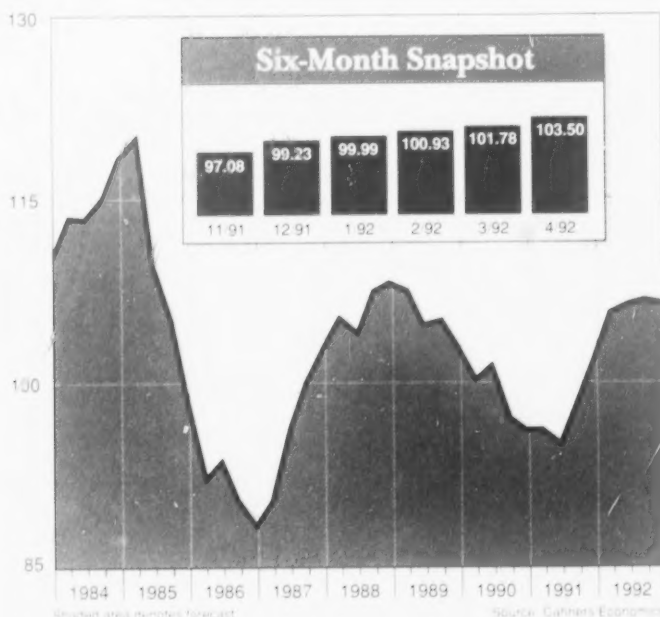
More surprising, purchases of communications equipment, which have normally bucked any downward trends in the IT industry fell during the second quarter of 1991, 1% lower than in the first quarter.

As a result, our Information Systems Performance Indicator dropped sharply during the second quarter after rising from what we thought was a low point in the first three months of the year. The ISPI continued to decline through the summer, too. That means it won't cross the growth-signaling 100 mark until late in the first quarter of next year. We expect capital spending on IS and related equipment to finally show some strength next year, up by some 11% once the growth pattern gets more firmly established.

For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617) 630-2105, send him a fax at (617) 630-2100 or write to him at Cahners Economics, 275 Washington Street, Newton, MA 02158.

The IS Performance Indicator

The ISPI has fallen even further than expected



	July 1991	June 1991	% Change 7/91-6/91	July 1990	% Change 1990-1991
■ Information-Processing Equipment					
Shipments, SA \$ bil.	184	184	0	188	3%
New Orders, SA \$ bil.	180	183	2	187	5%
Unfilled Orders, SA \$ bil.	170	164	4	169	4%
Inventory, SA \$ bil.	100	102	2	104	4%
■ Computer Production Workers					
Employment, NSA thousands	244	245	0	243	1%
Average Weekly Hours, monthly avg.	39.8	40.0	0	40.1	0%
■ Stock Index					
S&P's Composite Index (1984=100)	342	343	0	338	1%
■ Contracts & Orders					
New Plant & Equipment, SA \$ bil.	17	16	6	17	1%

SA = seasonally adjusted

NSA = not seasonally adjusted

MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

Who's Ready When Disaster Strikes?

BY WARREN CHILDS
Business Research Group

These days, most IS managers stick with the Boy Scout motto, "Be Prepared," when it comes to planning for events that could disable their information systems. Virtually all businesses rely on information systems to perform critical business functions. Because of this, IS managers spend a lot of time and money putting disaster recovery plans into place.

In the most recent survey of DATAMATION's Technology Panel, more than 90% of respondents indicate that their site has a disaster recovery plan. Of that group, 86% say they have a formal document. But only 56% feel they are adequately protected against disasters.

Disasters can have many causes. Weather problems like hurricanes, tornadoes, floods and lightning, in addition to causing physical damage to systems, cause power outages and can prevent personnel from accessing facilities. Equipment failures such as disk crashes are common, and communications fail-

ures caused by work crews cutting lines can completely disable remote sites.

In many cases, IS organizations are required by government regulations, company auditors or insurance companies to have a formal disaster recovery plan. Disaster recovery plans may be as simple as having formal procedures for whom to notify in the case of problems, implementing and maintaining an uninterruptible power supply or keeping daily backup tapes stored at an off site facility.

Many larger companies, however, use a disaster recovery service that can main-

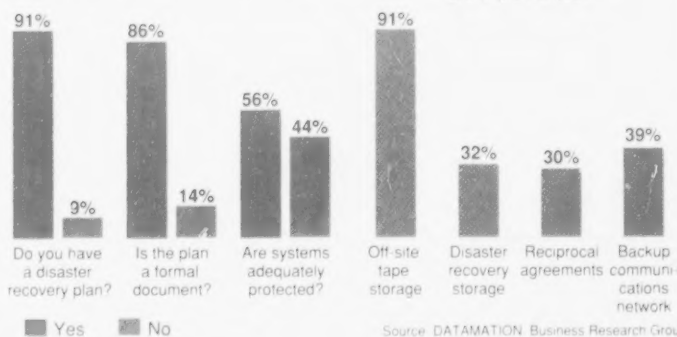
tain remote "hot sites." These hot sites contain computer facilities in which businesses visited by disaster can set up their backup tapes and run their business functions. Among the leading vendors of disaster recovery services are Comdisco Inc., IBM Disaster Recovery Services and SunGard Data Systems Inc.

For more information, call Nancy Finn at (617) 964-6204, send her a fax at (617) 558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

Thinking The Unthinkable

The importance of disaster recovery

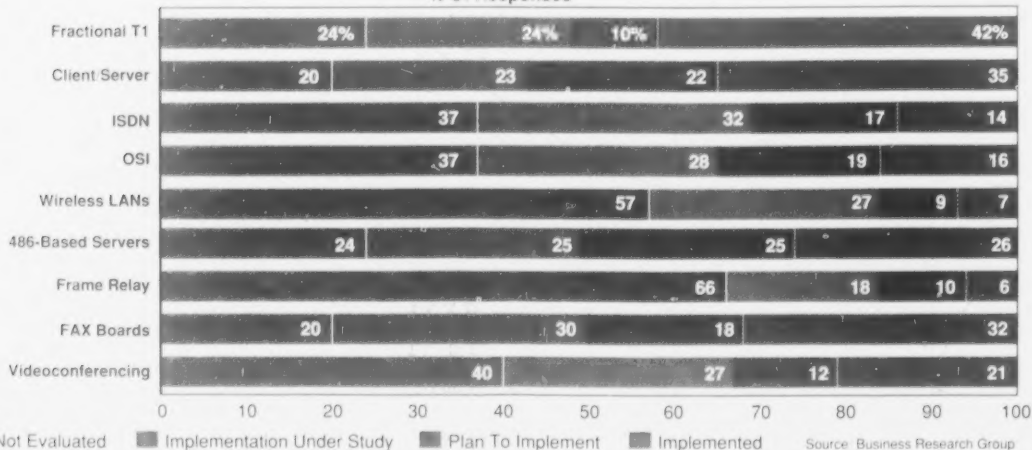
What disaster recovery steps are implemented?



DATAMATION's Technology Implementation Index: Networks/Communications

DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

% Of Responses



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A CAHNNERS PUBLICATION

DATA MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

NOVEMBER 15, 1991

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president and CEO,
Tandem Computers Inc.,
with the NonStop Cyclone/R



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Tandem Races To RISC 28

BY JEFF MOAD

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Cover photography by Chris Springmann

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Why PC Managers Still Want Services

Conventional wisdom suggests that what PC managers want most during a recession is low price. But they also crave service and support.

BY BOB FRANCIS

Is price everything in PCs these days? A quick glance at the daily headlines might suggest so. When Businessland Inc. recently succumbed to acquisition, many observers jumped to the conclusion that service and support—the hallmarks of this once-dominant PC retailer throughout much of the 1980s—were no longer as important as price. Recent heavy discounting via direct market channels, coupled with the arrival of mass merchandising in the form of PC superstores, only serves to reinforce this perception.

The only trouble is, it may be wrong. Despite signs that price is becoming more important to PC managers, most are still demanding service, support and the delivery of mission-critical applications on the PC platform—in short, many of the items that Businessland strived to deliver. So what went wrong? "I believe that Businessland overhead was simply too high to offer service as well as merchandise and still come out ahead," maintains William Y. Tauscher, chairman of rival ComputerLand Corp.

JWP Inc., the large systems integrator that purchased Businessland last summer and formed the new Canton, Mass.-based concern, JWP Businessland, is returning Businessland to its roots. Large customers like New York Life Insurance Co. are being reassured that service and support are still important. "They [JWP] are still providing the service and support we need, so we see no reason to change," says Donna O'Driscoll, assistant vice president in charge of field automation at the New York City-based insurer.

Meanwhile, the \$150 million PC-outsourcing contract that Businessland signed with Rochester, N.Y.-based Eastman Kodak Co. is still in effect. And, although no other contracts as extensive as Businessland/Kodak have surfaced,

officials at both ComputerLand and MicroAge Computer Centers Inc. say they have inked similar, although smaller, agreements.

Indeed, many other retail computer stores with national operations are hoping to prove that Businessland's original formula still works. Examples include CompuCom Systems Inc. of Dallas; ComputerLand of Pleasanton, Calif.; Inacom Computer Centers Inc. of Troy, Mich.; and MicroAge of Tempe, Ariz.

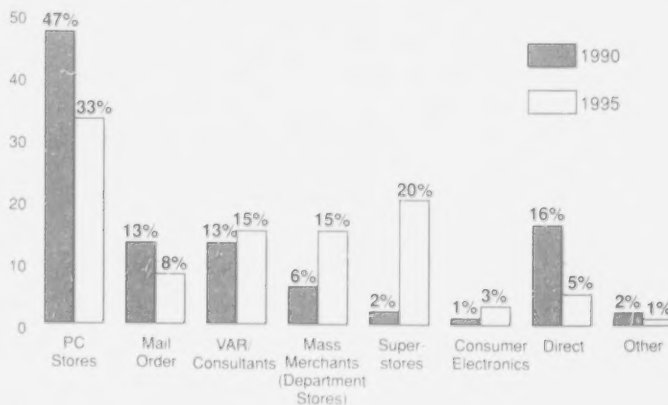
There is additional evidence that large companies still want the handholding that certain computer retailers can supply. Service and support remain key to PC purchases at Steelcase Inc., the business furniture giant of Grand Rapids, Mich. Although Steelcase has cut back on PC purchases due to the recession, the

company continues to buy most of its PCs from MicroAge. This is not to say that Steelcase isn't interested in getting a good deal. "The superstores are not in our area yet, so it is possible that we will look at them," says Aivars P. Apsite, microcomputer coordinator. But, he adds, "MicroAge has a superstore concept with their warehouse, so it doesn't look like we will need to change our policies." MicroAge's warehouse policy allows customers to purchase PCs with few added options at competitive prices.

Other users say they are continuing to use the same purchasing policies as in the past. "We're still buying Big Blue," says Jacqueline Bynsdorp, PC coordinator for Jockey International Inc. in Kenosha, Wis. Bynsdorp admits that the skivvies seller could have gotten better prices if

Where Corporate Buyers Shop

A recent survey of 1,200 PC buyers indicates where corporate buyers most like to shop today—and predicts where they may turn tomorrow.



Source: Dataquest

PCs & WORKSTATIONS

PURCHASING

it had shopped around. But, she maintains: "We may have missed out on some deals, but in the long run it's probably been a blessing because we haven't had any connectivity problems in our networks."

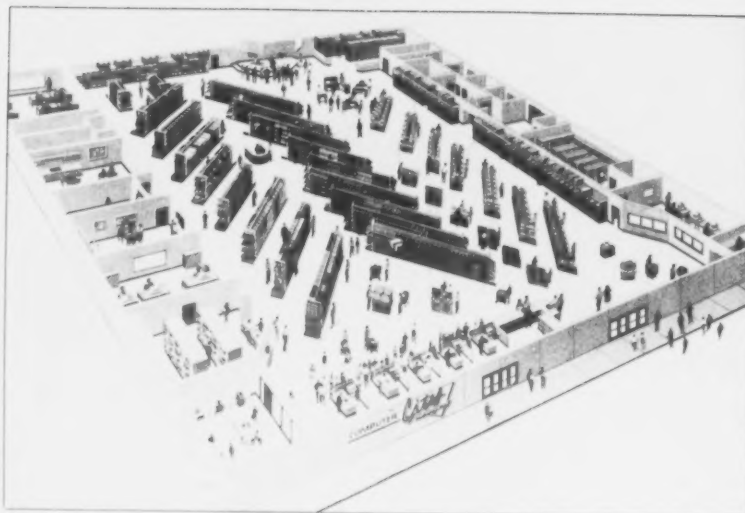
Superstores To The Forefront

There will, of course, always be a class of buyers interested in price. And, although big corporate customers may be slow to change traditional buying habits, the entrance of computer superstores is nevertheless shaking up the market, as these large, warehouse-like retail establishments get set to take some business away from the traditional PC retailers. Douglas Kass, a senior analyst at San Jose, Calif.-based Dataquest Inc., believes most traffic will be generated by small businesses and professionals. Still, he's convinced that superstores will pull in some corporate customers. "If they're offering a better price than the traditional supplier, they're going to get some of the business, particularly in a recession," he says.

The leader so far is Compt SA Inc. of Dallas, which has 17 superstores nationwide and sells PCs manufactured by Dell Computer Corp., as well as other suppliers. (Dell officials say they charge the same price to those who buy directly over the phone from Dell as they do to those who go to a retail outlet like Compt SA.) Compt SA takes a consumer approach to the business by offering plenty of inventory, wide aisles and low prices. Besides covering standard warranty work and configuring new systems on the spot, very little additional service is offered by Compt SA or other superstores.

The traditional retailers are hardly standing still as discounters open their doors. ComputerLand has opened its own superstore in Atlanta; MicroAge now offers its customers a warehouse-type purchasing arrangement; and Computer SuperCenters International Inc., a subsidiary of Tandy Corp. in Fort Worth, is planning to open a nationwide chain of Computer City SuperCenters before the end of the year. Tandy's initial superstores will be located in Austin and Houston, Texas; Buffalo, N.Y.; Detroit; Garden Grove, Calif.; Minneapolis; and Seattle. "We have a real sense of urgency to make this happen," says Tandy chief executive officer John Roach.

Vendors used to using other channels are also making moves to court the corporate market. Despite being known as a mail-order house, for example, Dell has support personnel in 25 U.S. cities to



FILL 'ER UP, PCs: By 1994, Tandy plans to have 100 of its Computer City superstores in operation.

handle key corporate accounts. The company has also begun selling in non-traditional outlets such as Staples, a large office supply chain. And Dell has strengthened its value-added reseller channel, as well. As a result, Dell reports that its sales to corporate customers doubled in the second quarter over the previous year's figures. Even some large computer companies, notably Digital Equipment Corp., are taking another look at the corporate market and are now selling their PC products directly through the mail.

Meanwhile, the value-added retailer channel is also changing, as some of the regional VARs attempt to go national by offering systems integration services to larger corporate accounts. For instance, CompuServe Inc. of Columbus, Ohio, recently purchased two local area network systems integration companies: Dallas-

based MicroSolutions Inc. and SEARA Information Strategy Corp. of McLean, Va. Both of those companies will now offer their services nationwide as part of CompuServe Systems Integration Group. Company officials say this service is necessary as their customers implement client-server applications.

For PC purchasers, though, one wild card that could dampen enthusiasm for services is the lingering recession. "The economy has affected our PC purchases more than any changes in the channel," admits Steelcase's Apsite. Nevertheless, service and support are likely to remain key concerns for IS managers seeking the same level of support they now enjoy with mainframes. Says Jockey's Bynsdorp: "If we're going to be putting mission-critical systems on this platform, we're going to need equipment and service that meets those needs."



Many network managers today face a difficult problem: How do you build and manage a facilitywide network out of what can be a mess of independent networks, all using different protocols and media?

"We're trying to divide and conquer," says Mark Wheeler, a network manager for Hughes Aircraft Co. in El Segundo, Calif. He handles five buildings, two remote subsidiaries, 2,300 nodes and is trying to consolidate the network down to the TCP/IP, DECnet, OSI, AppleTalk Phase II and Novell IPX protocols. This Hughes location is wired with fiber, twisted pair and coaxial cable. The fact that all of this is considered "consolidation," underscores the complexity of Wheeler's job.

Part of Wheeler's solution is to use a smart hub, a piece of hardware increasingly adorning wiring closets in large companies. Hubs, also known as concentrators, have been around for years. Smart hubs are an outgrowth of the commonly used 10Base-T hubs that concentrate Ethernet over unshielded twisted pair networks. Hubs, smart or dumb, enable the construction of a buildingwide structured-wiring system—typically vertical backbones with horizontal subnets. But smart hubs are increasingly becoming more powerful.

The first improvement intelligence brought to hubs is the ability to manage networked workstations. Administrators can remotely turn on or off a network port from a management workstation, rather than having to run to a wiring closet every time they suspect they might be having a problem with a particular end node. They can also segment a network to isolate heavy traffic. Increasingly, smart hubs are being used to provide a fairly sophisticated level of network management, including standards-based element management and an interface to umbrella managers such as IBM's NetView or Hewlett-Packard Co.'s OpenView. Troubleshooting and maintenance have also been simplified with "hot-swapping" features, which allow replacement of faulty cards in the concentrator without disrupting the network.

And now smart hubs have acquired the flexibility to serve as means of integrating, at least on the lowest levels, various types of networks. High-end models can bring together over 100 workstations in a single chassis, combining various media flavors of Ethernet, Token Ring and fiber connections all in one unit. At first glance, that may seem like a way of perpetuating the chaos of the past but, for

Sitewide Nets, The Smart Way

Trying to forge a single logical sitewide network from 10 years' worth of different LAN media and protocols? Smart hubs may be your ticket to immediate connectivity and migration to tomorrow's standards.

BY SUSAN KERR

managers like Wendell Klingensmith, it's a way to move rationally toward a more planned vision.

As information network services director for Case Western Reserve University, Klingensmith is working toward the day that each student will have a workstation that can run data, voice and video simultaneously through multiple live windows. Recognizing that all the needed technologies are not here today, Klingensmith and others at the Cleveland-based university are putting in place the infrastructure that will allow them to upgrade gradually. One of the pieces helping them do this is smart hubs.

"Everyone is in transition," Klingensmith says. "Nobody is at the same point at the same time. We might have one user over here who needs gigabits and another

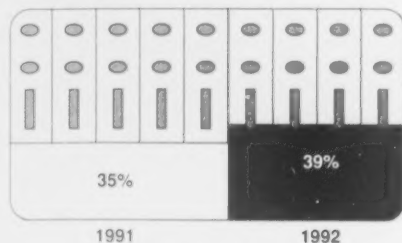
other who is okay with a 10-megabit Ethernet. So do you overkill and give everyone Sonet [gigabit-bandwidth optical networking] today? No. You need a smart hub so you can do it over time."

The transition to high-bandwidth networking was recently addressed by 3Com Corp., which has introduced its own line of smart hubs after remarketing others' for several years. The LinkBuilder 3641 not only provides bridging between Ethernet and Fiber Distributed Data Interface (FDDI) networks, but opens up the possibility of creating what 3Com terms "personal LANS," as well. In an organization with a small number of users who need high bandwidth, is managers can simply give them a direct, full 10-megabit-per-second Ethernet connection to the backbone, isolating them from other

Structured Wiring Gaining Ground

Smart hubs are key components of structured-wiring systems, which are gaining ground as LANs grow and become internetworked.

The 1991 DATAMATION Cowen & Co. survey shows that 35% of 3,600 DATAMATION readers are implementing structured wiring this year and another 4% plan to next year.



Source: DATAMATION/Cowen & Co.

NETWORKS

SMART HUBS

LAN traffic. The conversion to FDDI can be delayed until prices go down.

Although Case Western is not taking the personal LAN approach, it is rewiring most buildings so that fiber-optic cable runs to desktops. But the 15-group found that it had to keep some older buildings (which will eventually be torn down) wired with both thin and thick Ethernet. Today, the group primarily runs Ethernet with some FDDI as well, and hopes eventually to move to a Sunet-based

EVERYONE IS IN TRANSITION. NOBODY IS AT THE SAME POINT AT THE SAME TIME.

backbone network. Each of the university's 19 buildings houses at least one smart hub from Cabletron Systems Inc.

"Networks have gotten much more sophisticated," says David Fowler, vice president of marketing for Chipcom Corp., another maker of smart hubs. "It used to be that a network existed around a server or a computer, but over a period of time a company may have grown literally dozens of even hundreds of networks. Customers want to interconnect them, and it may be that users who need to be logically together [on the same network] are not physically together."

To do that, users will pay between \$75 and \$300 per port for the smart hubs. On the low end, that's not much different from a standard 10Base-T hub. For those with simple needs and small budgets, an increasing number of small eight to 12 port, basic smart hubs are available in the \$1,000 range. On the high end, users are paying a \$100 to \$200 per port premium for flexibility and manageability. Configuring hubs only for 100 can cost costs to \$1,000 to \$2,000 per port. The total cost of more complex hubs can run into the tens of thousands of dollars for a large unit with over 100 ports and advanced features such as fiber connections and bridge or router modules.

Cautious Users

As vendors pack more and more functions into these smart hubs, users are reacting with caution, concerned about doing too much with a single box.

"I haven't seen that it's practical or easy to handle multiple wires or types of cable in one box," says Keith Segerson, director of communications and network services for George Mason University, a unit of the Virginia state university sys-

Smart Hub Vendors

The following is a selected list of smart hub vendors. Most offer hubs with multiple media and protocol support.

AT&T/NCR
Dayton, Ohio
Circle No. 350

Fibermux Corp.
Chatsworth, Calif.
Circle No. 357

Plexcom Inc.
Simi Valley, Calif.
Circle No. 364

BICC Communications Inc.
Westborough, Mass.
Circle No. 351

Gandalf Data Inc.
Wheeling, Ill.
Circle No. 358

Proteon Inc.
Westborough, Mass.
Circle No. 365

Cabletron Systems Inc.
Rochester, N.H.
Circle No. 352

Hewlett-Packard Co.
Roseville, Calif.
Circle No. 359

Racal-Datcom Inc.
Sunrise, Fla.
Circle No. 366

Chipcom Corp.
Southborough, Mass.
Circle No. 353

Lannet Data Communications Ltd.
Huntington Beach, Calif.
Circle No. 360

Synometrics Inc.
North Billerica, Mass.
Circle No. 367

Codenoll Technology Corp.
Yonkers, N.Y.
Circle No. 354

Lantana Technology Inc.
San Diego
Circle No. 361

Synoptics Communications Inc.
Santa Clara
Circle No. 368

David Systems Inc.
Sunnyvale, Calif.
Circle No. 355

Multi-Tech Systems Inc.
Mounds View, Minn.
Circle No. 362

3Com Corp.
Santa Clara
Circle No. 369

Digital Equipment Corp.
Maynard, Mass.
Circle No. 356

Optical Data Systems Inc.
Richardson, Texas
Circle No. 363

Zenith Electronics Corp.
Glaryview, Ill.
Circle No. 370

Source: DATAMATION

tem located in Fairfax. "You have to pick a direction. As soon as you start combining twisted pair, coax, etc., you get back into all the problems we're trying to get away from." Segerson is faced with the challenge of trying to eliminate, broadly, hand the end, with its attendant complexity and fine-tuning requirements. Smart hubs don't necessarily help there, so George Mason is rewiring with a fiber

be aware of where you're plugging people in," says Wheeler. "If you're going to have multiple devices speaking to each other, you'd better be prepared for some real coordination, such as knowing what segment supports what protocol."

Which Route To Go

Users like Wheeler also face a series of decisions about whether they want to take advantage of the increasing routing and bridging capabilities of smart hubs. More and more hub vendors are placing routers into their products, and some, including Cabletron, Chipcom and SynOptics Communications Inc., are actually buying their router technology from Cisco Systems Inc. of Menlo Park, Calif. Wheeler's experience in installing Cisco routers made him opt against installing routers inside hubs except at one small remote site.

"We're looking to keep routers outside the hubs," Wheeler says. "We want to have Cisco do the direct support. Keeping up with the software and firmware ROM updates is a challenge in itself, without throwing in another manufacturer."

Additionally, Wheeler brings up the is-

I HAVEN'T SEEN THAT IT'S PRACTICAL TO HANDLE MULTIPLE WIRES IN ONE BOX.

backbone and unshielded twisted pair to the desktop. That, feels Mason, will be the least expensive route.

Although happily using Chipcom hubs to connect multiple Ethernet networks, Hughes's Wheeler is wary of using hubs in some of their more advanced and newer uses. Mixing media within a concentrator works fine, he says, but mixing protocols is something different.

"Each protocol has a different numbering scheme, which means you have to

NETWORKS

SMART HUBS

sue of cost. He says that a subsidiary at Hughes just paid approximately \$6,000 for a Synoptics router board for its hub. He says the list price for a stand-alone Cisco router could be as low as \$4,995.

Vendors, particularly those that integrate other manufacturers' devices into their boxes, concede that often it is no cheaper to buy bridges and routers built into the smart hub. A spokesperson for Santa Monica, Calif.-based Retix, which supplies remote bridges to a number of hub vendors, points out that customers are paying an additional margin on the integrated product. On the plus side, William Bailey, Access/One line manager for Ungermann-Bass Inc., says:

☐ MIXING MEDIA WITHIN A CONCENTRATOR WORKS FINE, BUT MIXING PROTOCOLS IS DIFFERENT.

"You gain economies of scale; less training, fewer vendors to deal with, and you solve a lot of plumbing problems by having everything in one box."

Although the trend is to include more routing and bridging functions in hubs, for certain applications, this arrangement may not be ideal. Large sites with a great variety of networks, such as at Hughes, may be better suited to separate boxes, says Curt Wheeling, marketing vice president for David Systems Inc. David Systems chose not to use other vendors' bridges and routers but instead developed its own technology for its smart hub line.

"Our approach is there's a big market for complex routing at the high end, and that's where vendors like Cisco will shine," explains Wheeling. "But there's also a huge market for customers who need simple routing—for example, they use Novell networks and need to route them. We'll do the simple routing, but not every single protocol out there."

Nonetheless, the technology planners behind smart hubs defend adding more and more features into a single rack. "A user should expect to double capacity in two years and triple in three years and must look at what technology he's going to need," believes Chipcom's Fowler. By being modular and flexible, smart hubs allow changes in rewiring and expansion under a single management umbrella, he adds. And, as the technology matures, customers will become more comfortable with the idea of a single box. ☐

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Aldus Corporation	MicroAge, Inc.
Amdahl Corporation	Microsoft Corporation
Apple Computer, Inc.	MIPS Computer Systems, Inc.
ASK Computer Systems, Inc.	NC R Corporation
AST Research, Inc.	Network General Corporation
Borland International, Inc.	Network Systems Corporation
Cabletron Systems, Inc.	Novell, Inc.
cisco Systems, Inc.	Oracle Corporation
Cognos Incorporated	Parametric Technology Corporation
COMPAQ Computer Corporation	Progress Software Corporation
CompuCom Systems, Inc.	Pyramid Technology Corporation
Computer Associates International, Inc.	QMS, Inc.
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Data General Corporation	Slate Corporation
Dell Computer Corporation	Storage Technology Corporation
Digital Equipment Corporation	Stratus Computer, Inc.
Electronic Data Systems	Sun Microsystems, Inc.
Everex Systems, Inc.	Symantec Corporation
Gupta Technologies, Inc.	Tandem Computers, Incorporated
IBM Corporation	Tandy Corporation
InaCom Corporation	Telebit Corporation
Informix Corporation	3Com Corporation
Intel Corporation	Ungermann-Bass, Inc.
Intuit, Inc.	Valid Logic Systems Incorporated
KnowledgeWare, Inc.	Xerox Corporation

COWEN & COMPANY
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The Desktop Wins Big In 1992 Budgets

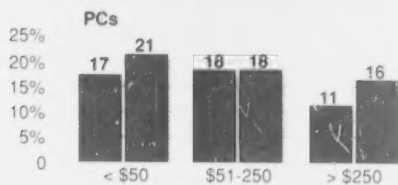
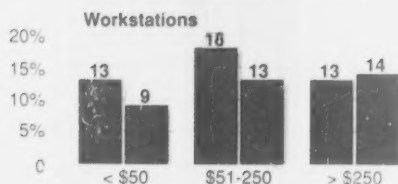
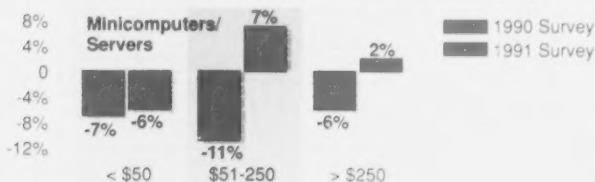
After being hit hard by recession, IS managers are poised to satisfy a huge pent-up demand for small systems and software. The big winners in 1992 budgets are PCs, networks and client/server tools.

BY BOB FRANCIS AND PAUL PINELLA

1992 Budgets Up Across The Board

Users are increasingly upbeat as they prepare their 1992 budgets, particularly for PCs and server-based systems.

NET % DIFFERENCE BETWEEN SITES INDICATING "HIGHER" AND THOSE INDICATING "LOWER" SPENDING IN 1992/1993 THAN IN 1991/1992



Organization Size
(By 1990/1989 Revenue, In \$ Millions)

Source: DATAMATION Cowen & Co.

Is the recession over?

The answer is a cautious "yes" if you look at the spending plans of IS managers over the next 12 months. According to the fall DATAMATION Cowen & Co. survey of IS managers' plans to purchase mini and microcomputers, which was mailed to 65,000 DATAMATION subscribers last summer, IS managers appear ready to ratchet up their 1992 spending for PCs, workstations, minicomputers and software. Increasingly attractive prices at the desktop and networking levels, combined with the perennial backlog of applications, are spurring this growing user demand. And that's quite a turnaround from only six months before, when a similar readership poll taken last winter indicated budgets were being clipped in the face of the Gulf War and recession.

For minicomputer vendors, the spigot has opened only slightly. But even that trickle will be welcome. Most mini suppliers have been battered by a gang of PC networks, workstations and open systems vendors intent on stealing their business.

Previous surveys disclosed a conspicuous drop in proprietary minicomputer market share, with the exception being IBM's AS/400. But now demand seems to be stabilizing. Each of the Big Three—IBM, Hewlett-Packard Co. and Digital Equipment Corp.—has reason for optimism. Each has taken steps to link its architecture with other operating systems and with networks, blurring the line between open and proprietary.

Longer term, however, IS managers indicate that over half of their applications are headed toward the desktop, not minicomputers or mainframes. Suppliers staking their fortunes on interoperable tools and

relational databases for client/server systems will be rewarded as companies of all sizes struggle to integrate desktop systems into enterprise networks. As IS managers finish up their 1992 budgets, the survey indicates the following buying trends:

- Despite a couple of years of lean growth and the recession, pent-up demand for desktop systems and software remains strong.

- Favorable pricing has emerged as the most important attribute in a PC supplier, but not at the expense of service and support.

- Microsoft Windows 3.0 and Windows applications are taking the desktop by storm. OS/2 use is increasing only in large companies still true to IBM's micro-to-mainframe vision.

- Client/server computing is here and lifting the fortunes of network supplier Novell Inc., database kingpin Oracle Corp. and a whole panoply of smaller firms building bridges, routers, smart hubs and other networking glue.

- The applications backlog is growing larger, brightening the prospects of packaged software suppliers and vendors of computer-aided software engineering (CASE) tools.

Likewise, budgets on the mainframe side are showing good promise for 1992 after poor trends were plainly indicated in 1991. According to a late summer follow-up survey of IBM mainframe sites polled during last spring's DATAMATION, Cowen & Co. report, a significant one-third of all IS managers planned to defer or cancel major hardware purchases for the remainder of this year. However, almost two-thirds of the respondents who deferred or canceled such purchases plan to restore deferred projects by the end of 1992. And, on balance, preliminary big-system spending budgets for 1992 look positive, particularly among 3090-class mainframe users. Cowen analyst Steve Weber believes spending is finally bottoming out for Big Iron. "But a genuine recovery will not be visible for a while longer," he cautions.

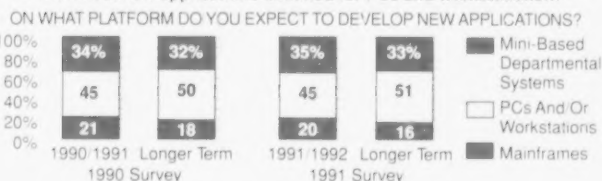
Priced-Right Personal Computers

Price is the most important factor in selecting a PC hardware retailer these days, 43% of respondents indicate. As a result, traditional PC leaders such as IBM and Compaq Computer Corp. are being squeezed by lower priced products from the likes of Advanced Logic Research Inc. (ALR), ASI Research Inc. and Dell Computer Corp. Dell, in particular, has moved into the catbird seat, offering users a mix of well-priced products while sending a clear message that buying direct doesn't have to mean inferior service. Clearly, the message is getting through—service/support ranks as the second most important factor to PC purchasers.

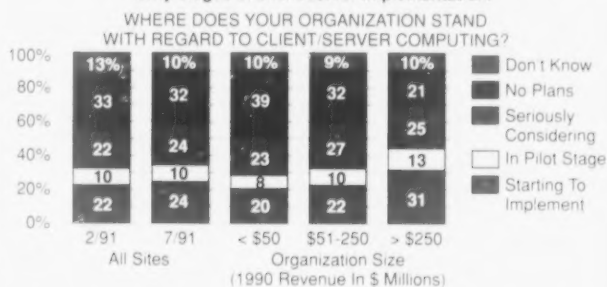
Laptop shipments will continue to grow as a percentage of total PC purchases. Over the past year, laptops accounted for 12% of all survey respondents' unit purchases; IS managers expect that to increase to 15% in the 12 months following the survey. But even in this high-growth, high-tech area, price is king. Market leaders Compaq, IBM, Toshiba Corp. and Zenith Data Systems Inc. may all suffer next

The Surge In Desktop Systems

With most new applications destined for PCs and workstations...

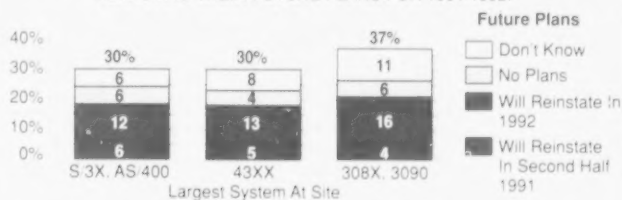


...Nearly 45% of largest respondent sites are already in the early stages of client/server implementation.



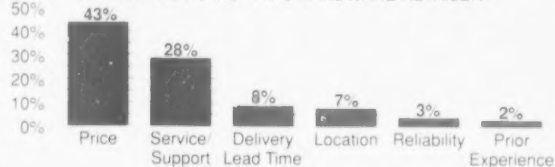
Fully one-third of respondents have canceled or deferred major hardware purchases this year, but an encouragingly large percentage of those deferring plan to reinstate their projects by the end of 1992.

% OF SITES THAT CANCELED MAJOR HARDWARE PROCUREMENT PLANS AND THEIR FUTURE PLANS FOR 1991/1992.



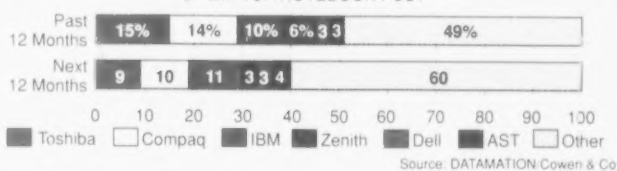
Price, followed by service and support, is the most important user criterion in the selection of a PC hardware retailer.

WHAT ARE THE ONE OR TWO MOST IMPORTANT CRITERIA IN YOUR SELECTION OF A PC HARDWARE RETAILER?



The traditional market leaders in laptops will continue to lose share to smaller, cheaper suppliers.

WHO WAS, AND WILL BE, YOUR PRIMARY SUPPLIER OF LAPTOP/NOTEBOOK PCS?



Source: DATAMATION Cowen & Co

SPECIAL REPORT

MINI/MICRO SURVEY

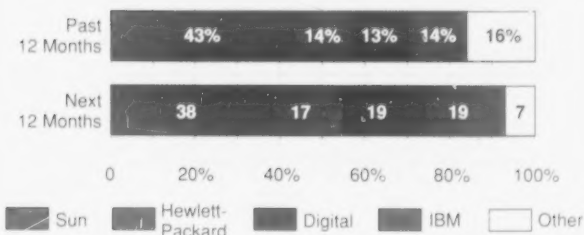
year as users turn to the amorphous "other" category for 60% of their laptop purchases. Price may also be responsible for a waning interest in Compaq's SystemPRO, a high-end server that was greeted enthusiastically last year but since has been hurt by the onslaught of clones and cheap Intel boxes.

Apple Computer Inc. has also shown itself willing to cut prices and introduce a boatload of new Macintosh models, including last month's announcement of the PowerBook notebook family. And although the company doesn't gain much market share by those moves, it does get a more favorable rating from its users. This year, that's more than Compaq and IBM can say, both of which received less favorable ratings from their customers in comparison to several major competitors.

Workstations Are Hot: Proprietary Minis Dominated By The Big Three

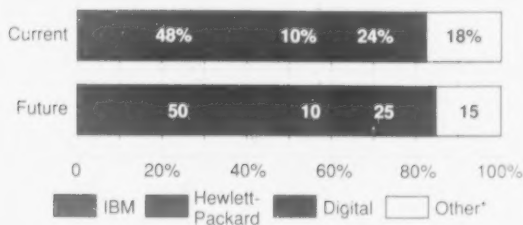
Users will spend more money for workstations with Digital, Hewlett-Packard and IBM over the next 12 months following the survey, at the expense of Sun.

% OF INDICATED SPENDING (BY DOLLARS)



In the proprietary midrange arena, the commercial market has narrowed to three major players.

WHICH MANUFACTURER DO YOU CONSIDER YOUR PRIMARY SUPPLIER?



*includes: Data General (2.3% current, 2.2% future), Unisys (2.3%, 2.2%), Wang (2.9%, 1.8%), Prime (1.5%, 1.1%), Tandem (0.5%, 0.5%) and Stratus (0.3%, 0.2%).

Note: These distributions relate specifically to the survey sample and should not be construed as representing the actual share distribution of industry shipments.

Source: DATAMATION-Cowen & Co.

Suppliers staking their fortunes on interoperable tools and relational databases will be rewarded

In recent surveys, Sun Microsystems Inc. has been chewing up pieces of the workstation pie from older established vendors. This year, however, Sun's share of workstation dollars declined, dropping from 43 to 38%. Users may be hedging their bets until the workstation leader wheels out its much-anticipated SPARCstation 3 models and begins shipping its 600MP multiprocessor servers, which were announced last month. Meanwhile, Digital, HP and IBM all show gains.

Rocky VI

IBM might do well optioning its RS/6000 story to Sylvester Stallone. Two years ago, Big Blue was a dark horse in the workstation sweepstakes with its 98-pound weakling, the R1 PC. No more. Now one year since volume shipments began, the RS/6000 is projected to constitute one-fifth of IBM's minicomputer, server and workstation sales. Significantly, the RS/6000's success isn't limited to IBM customers. Nearly half of sites purchasing this reduced instruction set computing (RISC) machine are traditionally non-IBM users; a hefty 17% of RS/6000 customers cite Digital as their principal technical systems supplier.

Hewlett-Packard may have a similar tale to tell this time next year about its new line of workstations. The company's new 9000 series multiuser systems and 700 series RISC workstations are projected to make up 51% of HP shipments to survey respondents by well into 1992, primarily at the expense of the company's 3000 series minicomputers. HP has also been successful in displacing other vendors in the commercial UNIX market, gaining share from Unisys Corp., Wang Laboratories Inc. and other, smaller suppliers. Although, it's too early to call the

Dell has moved into the catbird seat, offering users a mix of well-priced products.

new RISC boxes a success, currently HP is finding it difficult to meet demand for the product.

As demand for workstations heats up, what's left of the once-crowded proprietary midrange market appears to be carved up between three major suppliers—once again IBM, Digital and HP. Fewer than 10% of respondents name Data General Corp., Prime Computer Inc., Unisys or Wang as their major mini supplier. The competition has shifted to the commercial UNIX arena, where a variety of vendors ply their trade. But, even here, the Big Three hold down the top spots.

Continuing to lift IBM's midrange spirits is the AS/400, launched in June 1988. Despite its proprietary architecture, the AS/400 appears to be gaining ground among survey respondents at the expense of SCR Corp. and Wang, especially when it comes to users from larger companies. Ironically, small organizations, one of the original targets of the AS/400, are resisting the machine, as are many System/

SPECIAL REPORT

MINI/MICRO SURVEY

36 users. Only 20% of System 36 sites surveyed attempted an VS-400 upgrade during the year.

As noted in last year's survey, network computing has arrived. Fully 70% of the users say they have a network in use, well up from the 51% of respondents who said they were networked last year. Moreover, nearly 90% expect to have a network by mid-1992. Even more impressive are the near-universal links between PCs established in many organizations. Forty-four percent of users expect that 80 to 100% of their PCs will be networked by the end of 1992.

The Need For Networks

Enthusiasm for local-area networks runs strong in companies of all sizes, an especially good omen for market leader Novell. Once a questionable contender outside the realm of departmental networks, Novell's

NetWare offering now is clearly the front-runner, even in organization-wide networks, where it's poised

The connection between open systems and UNIX may have been broken.

to grab 53% of survey respondents' business in the coming year. Novell's multi-faceted strategy for branching out beyond the department and its recent marketing ties with IBM have so far proved effective against some heavy competition, including Microsoft Corp.

Despite a strong—and expensive—marketing push on the part of Microsoft, its LAN Manager 2.0 network operating system has barely cracked the double-digit mark in this latest survey. And next year hardly looks brighter, as responses indicate the Redmond, Wash., software giant will gain a subdued 2% of respondents' business, at the expense of smaller players, while NetWare grabs an additional 6%. It's too soon to count Microsoft out, especially with a new version of LAN Manager based on Microsoft's futuristic New Technology operating system on the distant horizon. But, for the moment, Novell has the momentum.

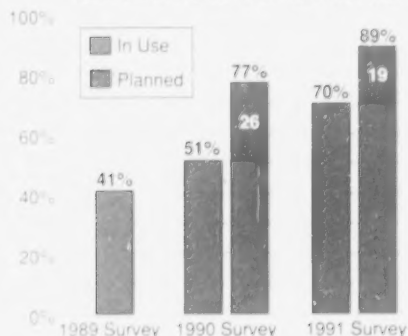
What's Hot In Desktop Software

As more companies implement new applications in client-server configurations, UNIX continues as the operating system of choice for respondents' future minicomputer and workstation systems. Yet, somewhat surprisingly, the growth rate of UNIX has slowed. From 1989 to 1990, interest in UNIX jumped nine percentage points to 36%. This year, that interest climbs just 2% among users, to

Networks Move Into The Mainstream

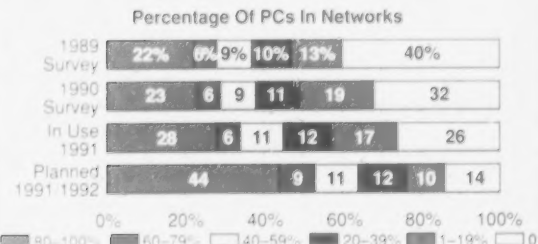
Recession or not, users are continuing to network PCs. By mid-1992, close to 90% of all surveyed firms intend to be networked.

% OF SITES WITH NETWORKS INSTALLED, OR PLANNING TO INSTALL A NETWORK



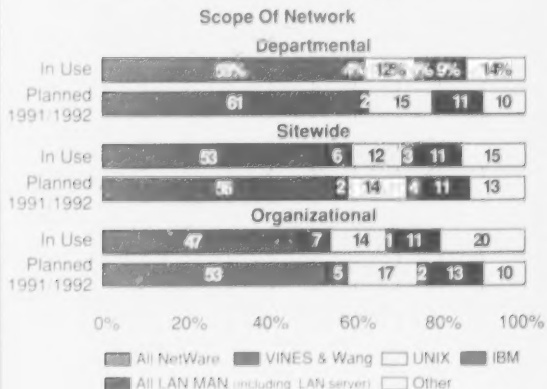
Network acceptance continues to accelerate amid the ever-shrinking pool of nonnetworked sites.

WHAT PERCENTAGE OF YOUR PCs ARE IN NETWORKS (VS. STAND-ALONE)?



Novell's NetWare dominance continues unchallenged in all sizes of networks.

WHICH, IF ANY, NETWORK OPERATING SOFTWARE IS ALREADY INSTALLED AND WHICH IS PLANNED OVER THE NEXT 12 MONTHS?



Source: DATAMATION Cowen & Co

SPECIAL REPORT

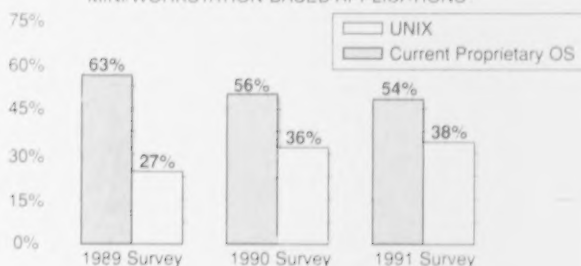
MINI/MICRO SURVEY

38%. Cowen's Weber speculates that the connection between open systems and UNIX may have been broken. "In the past, users did not separate the two. Now I think they see open systems in a broader sense," he says, suggesting that the stigma once held by proprietary systems as isolated platforms may no longer be valid.

UNIX Slows Down, DBMS And Windows Strong In '92

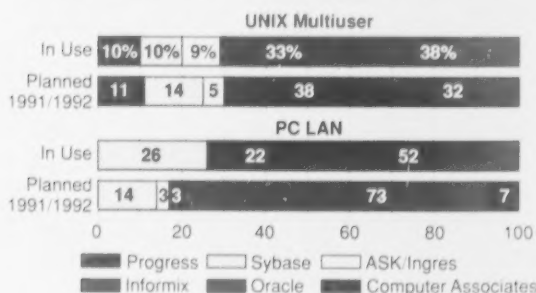
While interest in UNIX appears to be cooling...

WHICH OPERATING SYSTEM ARE YOU MOST LIKELY TO USE IN 1992 AND BEYOND FOR IMPLEMENTING NEW MINI/WORKSTATION-BASED APPLICATIONS?



...Competition remains heated for the remaining growth segments in the DBMS market.

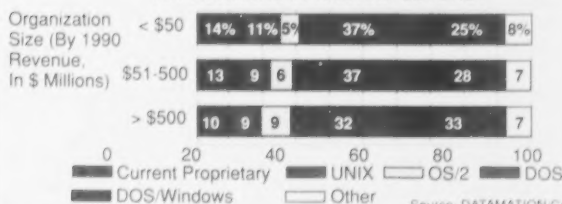
WHO WILL BE YOUR SUPPLIER OF DBMS SOFTWARE?*



*Among the top six independent DBMS vendors

DOS and Windows loom as platforms of choice for future productivity applications, leaving OS/2 vying with UNIX in organizations with revenue greater than \$500 million

WHICH OPERATING SYSTEM IS YOUR ORGANIZATION MOST LIKELY TO USE IN IMPLEMENTING NEW OFFICE/PRODUCTIVITY APPLICATIONS IN 1992 AND BEYOND?



Source: DATAMATION/Cowen & Co.

It's clear that Microsoft Windows has captured the hearts of high-end PC users.

No matter what the underlying operating system, the growing application development backlog is driving an increase in purchases of packaged software, according to respondents to the IBM Mainframe follow-up survey. Those users facing the longest backlogs—more than 24 months—anticipate the largest average annual budget increase for packaged software, nearly 9% per year over the next three to five years. Such backlogs presage a favorable market for CASE software, as well. In the Mini/Micro survey, Oracle looks to be a big gainer in CASE next year, capturing 26% of respondents' business versus the 12% now. KnowledgeWare Inc. loses ground, dropping to 29% from its current 40% perch.

Heated competition is also the order of the day in the database management system arena. Although growth has petered out in the proprietary minicomputer sector, multiuser UNIX and PC LAN users appear willing to make up the difference over the next 18 months. Survey results predict that vendors of DBMS software for proprietary operating systems will see a dramatic drop in demand as this transition occurs. Oracle's products and ASK Computer Systems Inc.'s Ingres products in this line will likely be hardest hit. But Oracle should reap big benefits with its PC LAN products, as will Informix Software Inc. and Sybase Inc. in the UNIX market. Oracle's gains come at a time when the installation of a client/server relational DBMS is cited by 24% of its managers as being in the cards over the next 12 months.

In PC operating systems, it's clear that Microsoft Windows has captured the hearts of high-end PC users. No matter the organization size, DOS and Windows are viewed as safe bets for both productivity applications and future in-house development. For the first time, respondents predict that regular DOS—that is, DOS without Windows—will soon constitute less than 50% of their installed base of PC operating systems. IBM's OS/2 will find a better reception among users with a network or mainframe orientation, the survey indicates. Any other operating system, such as Sun's recent entrant, Solaris, will have to contend with the strong grip DOS and Windows have on the installed base.

Survey Methods

The 16th annual DATAMATION/Cowen & Co. Mini/Micro Survey is based on 3,578 reader survey questionnaires returned following a mass mailing last summer to 65,000 DATAMATION subscribers. The survey is administered by Cowen & Co.-Institutional Services, a financial securities firm whose Boston and New York-based research team specializes in high-technology and health-care related companies. Although the survey does not constitute a scientific representative sampling of the U.S. user community, the results do highlight general directions toward which IS managers are moving their organizations in the year ahead.

An Image Of Document Management



Buried under three trillion paper documents, U.S. businesses can no longer afford to continue practicing archaic methods of document management.

BY JANET MANN
Faulkner Information Services

Today's businesses must deal with mountains of paper—letters, reports, vital records, sales literature, forms. In fact, approximately 95% of the more than three trillion documents currently stored in offices throughout the United States exist in paper form, and another billion or so pages are added to the pile each day. If the problem seems insurmountable, take heart; help is on the way. Imaging systems have made their way into the business market, promising to level the mountain of paper.

Imaging offers a wealth of benefits to organizations, including information management, increased productivity and efficient use of physical storage space. Perhaps most important, imaging helps businesses access information, eliminating extensive, exhaustive searches for documents and files that often disappear in traditional storage facilities.

Imaging is a broad umbrella term that incorporates a variety of systems and software products. A complete imaging system typically includes the following components:

- Workstations with high-resolution displays
- Scanners and optical character recognition (OCR) software for digitizing hard-copy information
- Software designed to manage document retrieval, work flow automation and communications functions
- Output devices
- Storage media—most notably the optical discs.

Optical Storage Technology

Optical storage is largely responsible for imaging's success. Optical media significantly reduces the amount of physical space required for archival storage and thereby reduces operating costs. Infor-

mation that fills 20 file cabinets can be stored on a single 5¼-inch disc.

A 5¼-inch optical disc stores 600 megabytes of information. That's the equivalent of about 200,000 pages, or more than 1,500 conventional 5¼-inch diskettes. Twelve-inch optical discs, which store as much as 6 gigabytes of information (about 800,000 pages), are becoming readily available, as are 14-inch disks, each of which can store about 7GB of information. The optical disc used by most imaging systems is the write once, read many (WORM) disc.

Optical jukeboxes, which operate much like musical jukeboxes (via robotics), are available for businesses with extremely high-volume storage requirements. These units contain multiple optical discs and permit users to access any or all interchangeably. Today's optical jukeboxes can store more than one terabyte of information.

Imaging can be subdivided into three major functional areas. The first group of functions includes the ability to scan, store and display documents on line as digitized images, providing essentially an electronic replacement for the traditional file cabinet with one major difference—the electronic file cabinet supports concurrent access by multiple users.

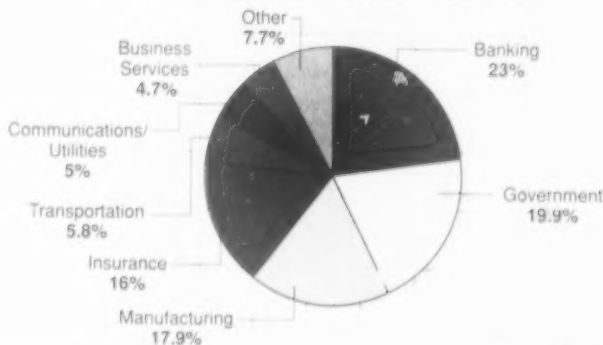
Getting Work To Flow

The second group of functions includes the electronic routing of information throughout an enterprise from one workstation to another, along with the automation of such processes as approval cycles, schedule issues, productivity measurement and report generation. This function is called work flow automation, a term originally coined by FileNet Corp.

A number of recently introduced, sec-

Who Uses Image Processing?

The insurance industry accounts for the greatest number of imaging systems in use, while banks claim the second largest share.



Source: IDC/Avante

MARKET REVIEW

ond-generation systems add a third function: they integrate with existing applications. These products can collect all the information required for a specific purpose and deliver it to a specific user. Although the need to integrate imaging with existing applications was not deemed critical for most organizations during the last decade, research by BIS Strategic Decisions of Norwell, Mass., indicates that more than 80% of today's users are eager to add this function.

Imaging debuted in the late 1970s in custom products from systems integrators. It wasn't until 1984 that FileNet pioneered the concept of the turnkey imaging system—a large-scale, proprietary optical disc system that incorporates work flow software for routing and managing information. Although FileNet is still a major participant in the imaging market, it competes with such notable market leaders as Eastman Kodak Co., IBM, LaserData and Wang Laboratories Inc.

Imaging isn't limited to any specific industry, but it is being readily adopted in a number of key areas. According to IDC/Avante Technology, the banking industry accounts for the greatest number of imaging systems in use. (See the chart, "Who Uses Image Processing?") Banks

use imaging for processing loan applications and charge slips, as well as for customer service. Government agencies, which claim the second largest share, use imaging to facilitate information access and reduce turnaround time. Insurance applications are aimed primarily at customer service, where prompt, accurate responses translate into increased revenues. Manufacturing companies say imaging reduces the time in taking a product from design to manufacture.

Imaging is available on the full gamut of hardware platforms. Moreover, imaging products address a broad range of user configurations from single users, to work groups large and small, to enterprise-wide operations. Prices are as diverse as the configurations themselves, ranging from about \$25,000 for a stand-alone PC-based system to nearly \$2 million for the largest enterprise-wide systems.

The Latest Trends

The trend in imaging is toward integration with existing applications, and an increasing number of vendors are focusing on this issue to make their products attractive to the growing base of knowledgeable users. The move toward integration with existing systems goes hand-in-hand with the larger trend toward

open systems. First-generation turnkey imaging systems were closed, stand-alone systems that required users to install proprietary workstations and servers. Although the level of support for open systems varies in today's market, most vendors now boast the ability to integrate a broad range of nonproprietary hardware components with their imaging systems. Most of the current imaging products include a high degree of work flow automation features to streamline the entire business procedure. High-end applications in paper-driven industries will continue to add users, although the PC segment of the market is likely to remain ripe for new users and vendors alike.

The accompanying resource list, which describes the market leaders of turnkey imaging systems, was gathered in a survey by Faulkner Information Services. The list represents more than 80% of the current market. □

Faulkner Information Services is a Pennsauken, N.J.-based independent publisher and research company specializing in information about computer and communications technologies. For more information on Faulkner's subscription services, contact the sales department at (800)-843-0460 or circle 521 on the Reader Card.

A Selected List Of Turnkey Imaging Systems

Advanced Graphic Applications Inc.

New York City
DISCUS Systems
Platform: PC
\$39,500 for entry-level configuration
Circle No. 501

Bell & Howell Co.

Chicago
Image Search Plus
Platform: PC
\$44,000 for a single user
Circle No. 502

Bull HN Information Systems Inc.

Billerica, Mass.
IMAGEWorks
Platform: Midrange
\$185,299 for server, \$35,902 per workstation
Circle No. 503

CPT Corp.

Eden Prairie, Minn.
Image File Systems
Platform: PC
\$28,995 to \$41,995
Circle No. 504

Digital Equipment Corp.

Maynard, Mass.
DECimage Express
Platform: Midrange
Software license fees range from \$5,000 per concurrent user to \$100,000 for 20 concurrent users. Hardware costs depend on configuration.
Circle No. 505

Eastman Kodak Co.

Rehoboth, N.Y.
KIMS 4000
Platform: PC
\$40,000 for stand-alone system.

\$100,000 for a networked system
Circle No. 506

FileNet Corp.

Costa Mesa, Calif.
Document-Image Processing Systems
Platform: PC and midrange
\$127,150 to \$474,355, depending on configuration
Circle No. 507

Genesis Imaging Technologies

Valley Forge, Pa.
Electronic Document Image Management System (EDIMS)
Platform: PC, midrange and mainframe
\$85,000 to \$100,000

Technical Documentation Information System (TDIS)

Platform: PC, midrange and mainframe
\$100,000 for minimum configuration
Circle No. 508

Hewlett-Packard Co.

Palo Alto
Advanced Image Management System (AIMS)
Platform: PC and midrange
\$40,000 for an entry-level system; \$400,000 for a 20-user system
Circle No. 509

IBM

Armonk, N.Y.
ImagePlus Systems
Platform: midrange and mainframe depends on configuration
Circle No. 510

Innet Corp.

Pine Brook, N.J.
Imageview Image Network
Platform: PC
\$39,900
Circle No. 511

LaserData

Tyngsboro, Mass.
LaserView Systems
Platform: PC
\$35,000 for stand-alone system; \$115,000 to \$163,000 for a networked system
Circle No. 512

Metafile Information Systems Inc.

Rochester, Minn.
Metaview Systems
Platform: PC, midrange and mainframe
\$40,000
Circle No. 513

Micro Dynamics Ltd.

Silver Spring, Md.
Multuser Archival and Retrieval System (MARS)
Platform: IBM PC and Macintosh
\$40,000 to \$50,000
Circle No. 514

NCR Corp.

Dayton, Ohio
NCR Document Management System (DMS)
Platform: PC and midrange
\$800,000 for 20 workstations to \$3.5 million for 120 workstations
Circle No. 515

Panasonic Communications & Systems Co.

Secaucus, N.J.
Pana File II System
Platform: PC
\$20,000
Circle No. 516

Sigma Imaging Systems Inc.

New York City
OmniDesk
Platform: PC
\$30,000 to \$35,000 per workstation
Circle No. 517

Tab Products Co.

Palo Alto
Laser-Optic Filing Systems
Platform: PC and midrange
\$49,995 for a minimum configuration
Circle No. 518

Unisys Corp.

Blue Bell, Pa.
InfoImage Systems
Platform: PC and midrange
\$750,000 to \$1 million
Circle No. 519

Wang Laboratories Inc.

Lowell, Mass.
Wang Integrated Image Systems (WIIS)
Platform: PC and midrange
\$175,000 to \$750,000
Circle No. 520

Source: Faulkner Information Services

NEW PRODUCTS

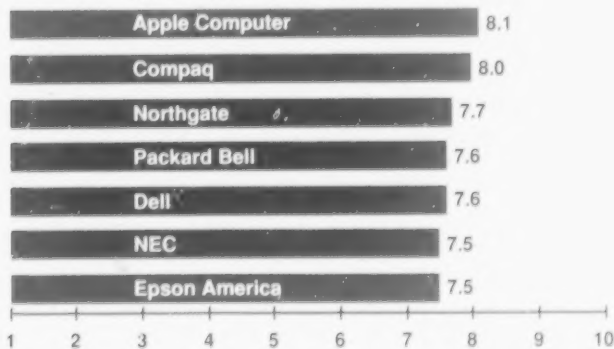
A SELECTION OF RECENT INTRODUCTIONS



Corporate Satisfaction Scorecard: Laptop Microcomputers

DATAMATION surveyed IS managers who have purchased laptop microcomputers to determine their level of satisfaction.

(1=Not Satisfied, 10=Most Satisfied)



Source: DATAMATION, June 1991

► SOFTWARE

WordStar-ing Windows

WordStar International Inc. has introduced WordStar For Windows 1.0, a high-level word-processing package.

Features include page layout, graphics, table generation, indexing, tables-of-contents generation, pagination, hyphenation, footnotes and end notes, and dBase mail-merge support. It also provides a spell checker and a thesaurus, outline numbering and style sheets. Users can edit text in what-you-see-is-what-you-get (WYSIWYG) mode and magnify portions of the document from 25 to 200%



WORDSTAR FOR WINDOWS 1.0 provides an on-line thesaurus.

to get a better look at it. A draft editor provides faster text editing. WordStar For Windows can collect various parts of a single document that might be on several different pages and show all of the text in one place.

WordStar For Windows provides both client and server support for Window's Dynamic Data Exchange (DDE), DOS file referencing and local area network support. It retails for \$495. WORDSTAR INTERNATIONAL INC.

Circle 535

Progress In Database Access

Progress Results, a five-module query and reporting tool, lets end users access information stored in Progress, Oracle and Rdb databases and RMS files. End users can also maintain simple databases and use them with corporate databases.

Progress Results is written in the Progress fourth-generation language. Its Query, Reports, Labels and Data Export modules let end users examine and modify database tables, create reports without programming, produce custom mail-

ings and export information to other software packages. The Administration module lets the MIS staff customize an application.

Progress works with a variety of operating systems and networking protocols, including DOS, OS/2, UNIX, VAX/VMS, DECnet, NetBIOS, Novell NetWare, SPX/IPX and TCP/IP. It is available in a developer's version and an end user/system administrator's version. Prices range from \$400 to \$134,000, depending on platform. PROGRESS SOFTWARE CORP., Bedford Mass.

Circle 536

The DR Is In

The newest release of DR DOS, an MS-DOS-compatible operating system, automatically loads itself, as well as buffers, device drivers, memory resident programs and network drivers into upper and high memory, freeing up to 628 kilobytes of main memory for applications.

Version 6.0 also includes a file compression system, which the vendor says can increase disk space by up to 100%, a disk cache based on MultiSoft Corp.'s Super PC Kwik and a defragmentation facility. DR DOS can also recover erased files. It maintains the erased data and avoids writing over it. A task switcher allows users to load up to 20 applications at once, then switch between them and cut and paste text and data from one application to another.

DR DOS 6.0 is available for \$99. DIGITAL RESEARCH INC., Monterey, Calif.

Circle 537

► PCs & WORKSTATIONS

Upgrading Is A Snap

The Compaq DeskPRO/M product family of modular personal computers can be easily upgraded with processor boards that snap into the chassis, says their maker, Compaq Computer Corp.

The DeskPRO/M family consists of four models, the 386/25M, 486s/16M,

MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

Security Gets Top Priority

BY WARREN CHILDS
Business Research Group

Although information technology managers have been dealing with security issues for decades, the recent growth of decentralized and distributed-processing applications has pushed security to the top of the pile of IS managers' problems.

In the most recent survey of DATAMATION's Technology Panel, all of our panel members said they believe security issues to be important. A strong 69% said security is extremely important; the remainder said somewhat important.

Despite this consensus that security is important, only 45% say they are very satisfied with their own current security levels. An equal number say they are somewhat satisfied with their present security levels, whereas 10% say they are dissatisfied with current security precautions.

Of all the steps panel members are taking to manage security, virus protection is by far the most common: 73% of panelists say they have implemented an anti-

tivirus procedure.

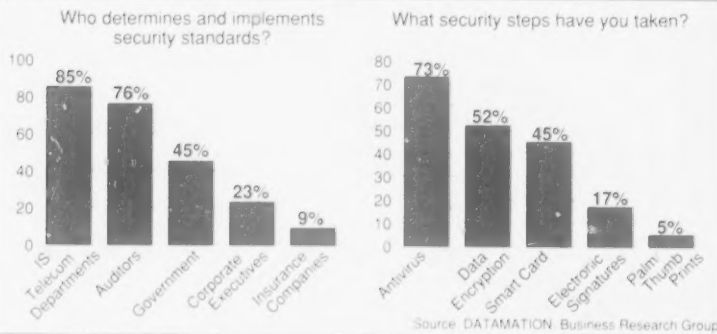
Other important steps panel members say they have taken include the encryption of data, to prevent unauthorized access to transmitted data (52%); the use of smart cards to restrict access to equipment (45%); implementation of electronic signatures, which are more difficult to duplicate than ordinary passwords (17%); and the use of palm and thumb prints to control equipment access (5%).

A strong majority of panel members—85%—say IS and telecom departments

take the lead role in determining and implementing security measures in their companies. But many also say that their corporate auditors, as well as government agencies, other corporate execs and even insurance companies, are becoming involved in setting standards.

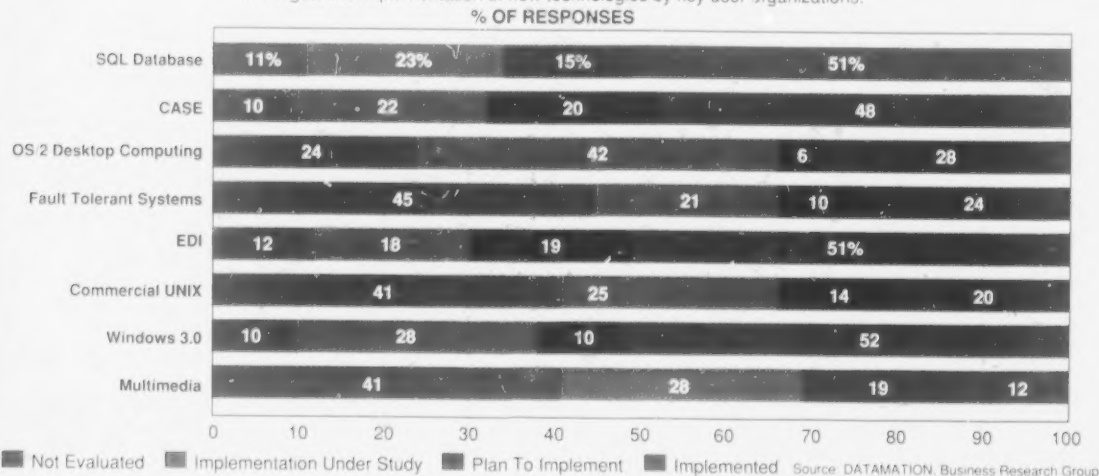
For more information, call Nancy Finn at (617) 964-6204, send her a fax at (617) 558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

The Data Center Lockup



DATAMATION's Technology Implementation Index: Systems And Software

DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.



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OS/2

IBM's Shon Saliga (left),
OS/2 2.0 development leader,
with Lori Brown (right),
OS/2 Workplace Shell designer

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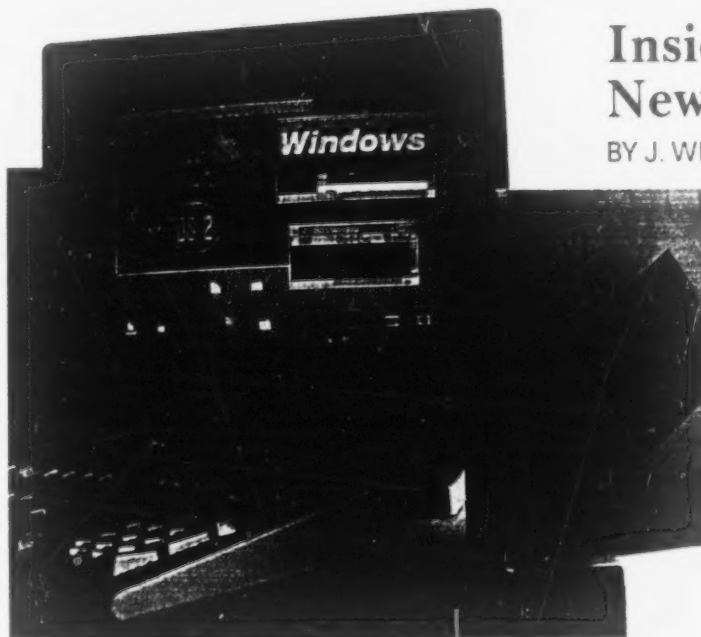
DATA MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

VOLUME 37
NUMBER 24

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Inside The New OS/2 26

BY J. WILLIAM SEMICH

Is IBM's new OS/2 2.0 really the advanced do-it-all operating system the company claims it to be? You decide. Here's an exclusive preview of the product IBM says will ship to users early next year.

Cover photography by Jim Kamp

IBM's new OS/2 2.0 is three operating systems in one box—OS/2, DOS 5.0 and Windows.

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Salaries Increase A Paltry 4.7%

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BY ANN DOOLEY

The recession whacked IS salary increases in 1991 down to their lowest levels in five years. But don't worry. With the right skills, you can still rake it in.

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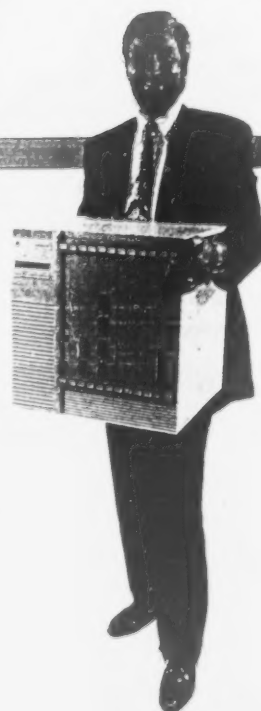
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Taking A RISC On FDDI 73

BY ELIZABETH LINDHOLM

3Com Corp.'s LinkBuilder 3GH offers scalable bandwidth, multiprocessing, and FDDI—right down to the desktop.

3Com's LinkBuilder 3GH provides FDDI performance using Ethernet personal LANs, says product manager Rohlman.



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The PC Big 50 42

BY PAUL PINELLA A handful of world-class suppliers dominates the PC market, but a large number of companies are playing a pretty marketing game that could cause them to "lose" it.

PCs & WORKSTATIONS

LAPTOP COMPUTERS

Portable PCs Get Colorful 49

BY EDWARD J. STONE AND LEE THE Right laptop is worth its weight in gold. Finding it is no simple task. What's right for you depends on your needs and your budget.

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Making Windows Network-Friendly 54

BY TOM McCUSKER Network administrators have been plagued with Windows 3.11, which can't let users see more than one network at a time. Windows Workstation 3.11 is a way to solve that.

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Bulletproof Your Software Contracts 61

BY RONALD ABRAMSON Did you know what rights you have in software you've written or in software you've purchased? Or that you may not own the custom applications you've had a consultant write? Here are six ways to avoid trouble and other problems.

DATA CENTER MANAGEMENT

Control Your Data Center 62

BY MIKE RICCIUTI Tired of tracking a tangle of software and hardware updates? Are you getting away from you? Data center management software can automate many details.

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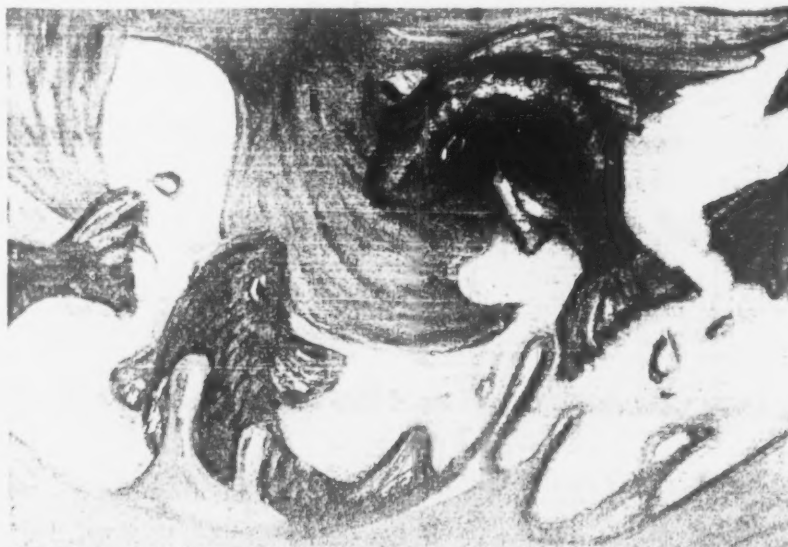
DA5D

New Ways To Distribute Mainframe Storage 67

BY NED SNELL Think the idea of supporting DA5D disk and tapes is far-fetched? Think again. New channel extensions will let the disk storage let's host and disk live apart, work together.

INTERNATIONAL

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Who are the big fish in the worldwide PC market? page 42



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EXCLUSIVE
SALARY SURVEY

Salaries Increase A Paltry 4.7%

The recession whacked IS salary increases in 1991 down to their lowest levels in five years. But don't worry. With the right skills, you can still rake it in.

BY ANN DOOLEY

A tough economic climate combined with ongoing downsizing and consolidations have made 1991 a rough year to be employed in the information-processing profession. IS professionals are facing the toughest market in recent memory for jobs and salaries. And they are being confronted with vastly different demands from their employers than they've known in the past. What's more, no turnaround is in sight in what has become a buyer's market for computing talent.

In fact, this year will likely go into the record books as one is would like to forget—quickly. In 1991, the profession has been dealt a one-two punch: smaller raises than the overall national average and a decline in total MIS/DP employment levels. Most firms did give their IS employees more money in their paychecks, but the amounts were smaller than the usual 5.5 to 6% increases that have been standard issue over the past five years. And in some companies IS professionals were struck by wage

freezes or even decreases in their salary scales.

As a result, DATAMATION's 1991 IS Salary Survey has found the average overall IS salary increase in 1991 to be only 4.72%, down from 5.6% last year. Yet the overall national wage increase for all U.S. professions was 5.3%, down from 5.5% last year, according to William M. Mercer Inc., a New York City-based compensation and benefits consulting firm. Mercer projects a 5.2% average salary increase in 1992 based on expected small increases in the cost of living and a slowly rebounding U.S. economy.

Adding to the woe is a 5.6% drop in overall U.S. MIS/DP employment levels, continuing the trend recorded in the 1990 DATAMATION Salary Survey, when the work force declined by 2.3%. All 11 industry segments specified in this year's survey reported a decline in total MIS/DP employment levels. The number of temporary IS employees, including part-time and contract personnel, is down this year, too, compared with last, indicating that companies are expecting more from their on-staff personnel.

One Step Ahead Of The Bill Collectors

Even though IS didn't fare as well this year as other professions did, it beat the rising cost of living. With the 1991 Consumer Price Index at 2.7%, average IS salaries grew 2.1% in real terms.

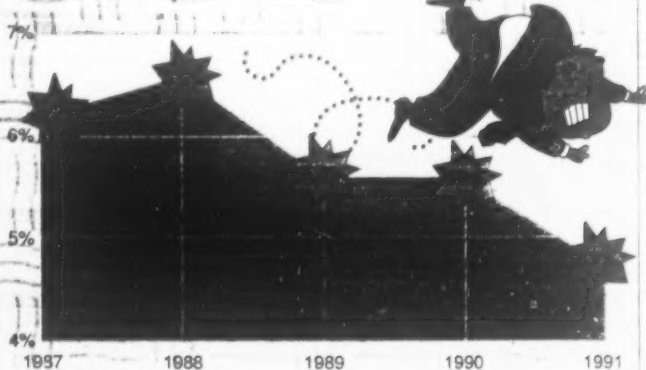
This year's annual salary survey examined IS professionals by region, industry and company size in relation to 23 different technical titles. Much of the change in salary levels can be attributed to regional economic factors, within the context of the recession as a whole. New England, for example, which was hardest hit by the downturn, is offering lower than usual increases for IS professionals.

And the fate of specific geographic regions is often closely linked to the industries that reside there. The New England region has been particularly hard hit by the recession due in part to its economic dependence on the financial, defense and minicomputer markets. Boston, which historically has a high cost of living but not necessarily a correspondingly high salary structure, received one of the lowest average salary increases for IS as a group at 3.57%, according to the DATAMATION survey. The place where IS salaries went up the most was the Dallas/Houston/Fort Worth area, where the average IS employee received a 6.77% raise.

Although the rate of increases has slowed and may not substantially improve next year, there is still

Whoops! Average Salary Increases Tumble

The recession has pounded pay hikes to their lowest levels in five years.



Source: DATAMATION Salary Survey

Daniel Gaudin illustration

Title

IS MANAGER
CIO/VP
Manager/Supervisor
END-USER
Manager/Engineer
Information Systems
PC Specialist
LAN Manager
WP/Systems
SYSTEMS
Manager
Senior Systems
Systems Analyst
Intermediate
Junior Analyst
APPLICATIONS
SYSTEMS
Manager
Senior Applications
Application Developer
Intermediate
Junior Applications
DATA COMMUNICATIONS
Network
Telecommunications
Communications
DATABASE
Database Administrator
Database Programmer
Microcomputer

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Average Salary By Major City (in \$)

Title	Average Weighted Salary	Boston	N.Y.C.	Wash. D.C.	Chicago	Dallas	San-Fran.	Los Angeles	Tampa
IS MANAGEMENT									
CIO / VP	106,864	117,045	117,143	100,000	107,353	132,083	133,409	124,443	78,873
Manager/Supervisor	65,811	81,842	75,000	60,714	62,500	74,286	78,421	73,103	50,379
END-USER SUPPORT									
Manager End-User Computing	56,808	57,500	58,889	58,571	57,143	63,500	69,333	61,389	43,906
Information Center Manager	54,346	51,667	53,750	52,105	46,000	58,125	59,375	68,077	47,500
PC Specialist Support	38,068	39,000	46,667	36,875	33,182	45,833	49,815	42,727	30,727
LAN Manager	45,880	48,571	48,333	46,563	51,250	43,182	61,429	46,923	41,452
WP Supervisor	36,538	37,000	41,875	32,500	35,000	32,500	40,000	43,000	36,053
SYSTEMS ANALYSIS PROGRAMMING									
Manager	65,357	65,357	71,500	60,417	72,333	64,412	74,211	67,174	56,828
Senior Systems Analyst and Programmer	50,345	48,000	55,000	46,875	50,312	49,444	60,238	55,417	45,182
Systems Analyst and Programmer	43,220	42,000	43,333	40,000	44,167	41,154	49,000	46,346	42,019
Intermediate Analyst and Programmer	37,517	36,250	36,250	36,591	38,000	37,188	43,333	41,579	32,727
Junior Analyst and Programmer	30,156	28,750	26,657	28,333	30,769	30,000	37,000	32,333	24,318
APPLICATION/OPERATING SYSTEMS PROGRAMMING									
Manager	64,481	65,000	76,250	61,500	73,636	58,909	71,786	68,667	50,514
Senior Applications/Operating Sys. Prog.	52,434	51,000	53,636	50,833	56,500	50,714	61,250	55,750	46,951
Applications/Operating Sys. Prog.	44,419	44,615	48,182	41,000	43,000	46,000	48,182	48,824	40,000
Intermediate Applications/Operating Sys. Prog.	37,150	37,000	35,909	37,188	35,714	36,667	43,000	41,250	31,563
Junior Applications/Operating Sys. Prog.	29,709	31,667	25,000	29,615	35,000	30,000	35,000	36,538	20,588
DATA COM/TELECOM/CONNECTIVITY									
Network Manager (LAN-WAN)	57,546	58,333	76,111	52,692	68,000	53,077	62,778	61,471	48,333
Telecommunications Manager	57,136	55,000	59,375	50,909	60,625	64,500	61,875	64,333	48,966
Communications Specialist	42,276	41,250	49,444	37,500	41,875	46,818	41,667	48,250	36,719
DATABASE									
Database Manager/Administrator	61,077	66,818	72,143	56,765	67,500	58,125	63,500	67,381	51,774
Database Analyst	48,194	48,182	55,000	44,286	45,625	47,500	55,000	54,167	42,727
Microcomputer/Workstation Manager	44,500	50,000	44,286	37,000	47,500	40,000	47,500	50,500	40,000

money to be made in it, with some top is pros earning well into the six figures. The average salary of the Chief Information Officer or Vice President of is nearly \$107,000. Silicon Valley paid the highest average salaries for that title, \$133,409, whereas the Tampa-Orlando-Miami area paid the lowest at \$78,873.

How Big Are The Big Bucks?

Other top earners were IS Managers, who received an average salary of \$65,811 nationally; Manager Of Systems Analysis And Programming, earning an average of \$65,357 this year; Manager Of Applications/Operating Systems, pocketing some \$64,481; and Database Manager/Administrator, pulling down \$61,077.

In addition to salary changes, DATAMATION's 1991 Salary Survey also examined employee benefits and here, too, found evidence of hard times. Benefits involving immediate financial payouts to employees decreased. Although long-term benefits like profit-sharing and pensions, for instance, stayed at similar levels to those of last year, the amount of medical and dental benefits, bonuses, overtime and use of a company car declined.

Interestingly, companies seem willing to spend more on what could be called preventive medicine. Spending for recreational facilities stayed even with 1990 levels and expenses for fitness and health programs increased 12%.

A worrisome statistic was a 5.6% drop in tuition reimbursements from 1990's level at a time when the need for is professionals to stay on top of the technology and the business has never been greater.

Figures for this year's DATAMATION Salary Survey confirm a truth that has been much discussed in is circles. But it's one that is people may not have been entirely successful in adjusting to: that the future lies with the is professionals who have combined their technological prowess with business savvy and communications skills.

Says James Weatherbee, professor and director of the MIS Research Center at the University of Minnesota: "The happy go lucky COBOL programmer is

Cities Where The Greenbacks Are Flowing...



The U.S. cities where is employees enjoyed the highest average percentage pay increases in 1991:

Dallas/Houston/Fort Worth 6.77%
Chicago 6.08%
Los Angeles 5.96%

And Where The Spigot Is Tight

The cities with the lowest average percentage increases in 1991:

Washington, D.C. 3.49%
New York 3.50%
Boston 3.57%



Source: DATAMATION Salary Survey

Dunel/Gudera Illustration

EXCLUSIVE SALARY SURVEY

going to be in trouble." IS can't afford to get stuck in time with a status quo attitude or skills. The future is for the IS professional who is aggressive and excited about the profession and technology and always interested in moving up the learning curve, Weatherbee says.

One company that is intent on having its IS employees continually move up that learning curve is Avery Dennison Corp., a manufacturer of labels based in Pasadena, Calif. Ron Claude, director of management systems in the corporate office, says that, to keep competitive, corporate IS is pilot testing a new wage scale that rewards both technical and

Companies seem willing to spend more on what could be called preventive medicine.

managerial excellence.

"People are paid based on how quickly they learn and adapt versus how well they can do what they learned years ago," says Claude. "We're willing to pay for key business strategies in a nontraditional way by matching the pay structure against business need. We're insisting that everyone learn new skills and will lower the salary for those who remain in the old mold. So far, the response has been positive. Everyone owes it to themselves to improve or it's a lose/

The future is for the IS professional who is aggressive and excited about the profession and technology.

lose situation for themselves and their company."

The impetus to learn new skills is a result of certain business and technological trends that are not recession related, in particular downsizing. Bill Cooke, senior business architect in information management at a major insurance company in the Northeast, says his firm is downsizing as a result of normal expense management, which is an ongoing corporate concern, irrespective of the recession. Cooke says his firm is moving toward use of computer-aided software engineering tools and away from its formerly large pool of COBOL programmers as it retools for the future. "Knowing one thing just isn't going to hack it," says Cooke.

What's In Store

But other IS pros caution that the desire to learn new skills should be done wisely, and that IS professionals should resist the temptation to deepen their knowledge about a particular technical area in favor of gaining broader skills. Kevin Moody, former corporate director of MIS at The Gillette Co. and former director of systems management at the First National Bank Of Boston Corp., advises that overspecialization could impede movement to other companies or industries.

Although Mo still able to plan der, is no lo rates that once fewer people an is profession being nomads, moving from o or changing fro McMahn, man national comp But turnover cession. Altho is profession may no longer

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Average Salary By Industry (in \$)

Title	Average Weighted Salary	Mfg./ Consumer	Mfg./ Industrial	Banking	Other Financial Services	DP Services	Wholesale Distribution	Government	Med Le
IS MANAGEMENT									
CIO / VP	106,864	128,012	100,741	124,318	109,130	157,500	130,000	71,731	64,000
Manager/Supervisor	65,811	83,333	74,821	76,500	67,143	60,000	57,143	51,739	42,000
END-USER SUPPORT									
Manager End-User Computing	56,808	74,187	62,667	57,500	58,500	55,000	48,750	31,750	28,000
Information Center Manager	54,346	56,667	60,833	56,818	53,500	63,333	49,000	47,500	40,000
PC Specialist Support	38,068	40,000	48,077	39,211	36,250	37,000	38,636	34,555	28,000
LAN Manager	45,880	55,000	52,857	46,000	45,000	52,000	52,000	42,500	40,000
WP Supervisor	36,538	55,000	42,500	32,500	34,000	40,000	34,000	36,667	40,000
SYSTEMS ANALYSIS/PROGRAMMING									
Manager	65,357	83,182	63,913	68,611	64,286	57,250	52,000	65,294	40,000
Senior Systems Analyst and Programmer	50,345	50,714	53,333	52,143	51,471	56,250	52,000	45,526	40,000
Systems Analyst and Programmer	43,220	44,000	43,462	45,250	42,647	44,750	41,667	38,571	30,000
Intermediate Analyst and Programmer	37,517	40,000	38,571	37,750	38,000	38,125	40,000	31,316	30,000
Junior Analyst and Programmer	30,156	28,750	35,714	30,000	27,143	32,500	26,675	27,500	20,000
APPLICATION/OPERATING SYSTEMS PROGRAMMING									
Manager	64,481	79,000	67,867	68,528	71,765	58,750	66,667	53,333	40,000
Senior Applications/Operating Sys. Prog.	52,434	55,000	55,938	52,353	56,000	55,000	53,125	47,105	40,000
Applications/Operating Sys. Prog.	44,419	48,571	46,250	46,176	46,563	46,429	40,000	37,500	30,000
Intermediate Applications/Operating Sys. Prog.	37,150	42,500	40,000	35,000	38,636	35,000	37,500	33,571	30,000
Junior Applications/Operating Sys. Prog.	29,709	30,000	32,500	29,615	30,455	30,000	28,750	23,125	20,000
DATA COM/TELECOM/CONNECTIVITY									
Network Manager (LAN-WAN)	57,546	63,750	59,643	59,643	72,800	57,222	56,000	49,231	40,000
Telecommunications Manager	57,136	58,750	66,111	59,231	67,500	63,125	60,000	46,429	40,000
Communications Specialist	42,276	37,000	43,000	41,667	46,818	40,000	43,750	36,786	30,000
DATABASE									
Database Manager/Administrator	61,077	71,000	60,500	64,643	70,385	52,500	62,000	51,786	40,000
Database Analyst	48,194	52,000	55,000	46,000	51,250	42,500	47,500	42,143	30,000
Microcomputer/Workstation Manager	44,500	35,000	55,000	45,818	43,750	47,500	43,750	43,000	30,000

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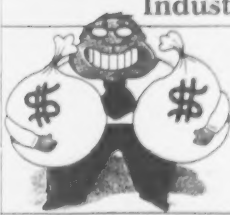
Although Moody and many others like him are still able to plan their own course up the career ladder, IS is no longer marked by the high turnover rates that once characterized the profession. Far fewer people are job hopping—voluntarily anyway.

IS professionals previously had the reputation of being nomads, hopping from one job to the next, moving from one region of the country to the next or changing from one industry to another, says Steve McMahn, managing director of the Boston office of national computer recruiting specialist Source EDP. But turnover rates were going down prior to the recession. Although people are still more loyal to the IS profession than to their specific industries, this may no longer be the best orientation, he believes.

For the future, IS professionals need to recognize that many companies are reluctant to retrain existing employees in today's buyer's market and would rather hire or retrain people who don't have too much mainframe baggage. The mainframe jobs won't disappear, but the opportunities will decrease and the possibility of advancement will quickly recede, McMahn says. And salaries won't increase if there's a large pool of workers to maintain increasingly automated mainframe equipment.

The technologies to focus on are cooperative

Industries With The Right Stuff...



The industry sectors that gave out the highest raises in 1991:

Financial Services 7.86%
Wholesale/Retail Distributors 7.11%
Banking 4.30%

And Those With Less Of It

The industry sectors that gave out the lowest pay hikes in 1991:

Education 1.56%
Medical/Legal Services 3.67%
Industrial Manufacturing 3.79%



Source: DATAMATION Salary Survey

processing, client/server, LAN software, PC operating system software, UNIX and object-oriented programming, he advises.

As employment requirements continue to change, some people are going to be displaced. But those that can adapt and learn new skills will reap new rewards.

Ann Dooley is a freelance writer based in Framingham, Mass.

Average Salary By Company Revenue (\$ Millions)

Wholesale Distribution	Government	Medical Legal	Trans. / Utilities	Education	Construction Mining	Other	>\$250	\$250-\$500	\$500-\$5,000	\$5,000-\$20,000	\$20,000+
130,000	71,731	64,500	114,167	103,571	76,667	101,600	82,292	84,697	104,844	128,780	129,700
57,143	51,739	42,500	66,667	51,250	52,000	65,104	50,204	61,094	68,534	75,811	73,269
48,750	53,750		63,462	49,000	43,750	54,310	47,200	46,667	58,871	62,593	60,857
49,000	47,500	40,000	61,364	46,000		51,500	43,529	46,250	56,957	60,741	56,071
38,636	30,455	27,143	41,071	31,429	30,000	38,250	36,053	31,600	39,405	40,429	40,833
52,000	42,500	40,000	44,500	34,000	40,000	45,833	42,368	46,667	48,519	46,250	45,172
34,000	36,667	40,000	40,000	25,000	25,000	38,846	32,500	40,000	36,667	38,235	37,000
72,000	55,294	40,000	67,105	50,000	62,500	65,814	58,958	53,421	65,288	71,216	68,261
52,000	45,526	40,000	52,750	40,000	45,000	49,375	46,935	46,250	49,500	53,784	52,843
60,455	38,571	35,000	42,727	32,500	40,000	47,867	45,000	39,464	42,750	43,553	44,592
40,000	31,316	25,000	39,000	32,500	40,000	38,448	35,000	38,333	38,256	36,250	36,500
26,875	27,500	25,000	36,313	25,000	25,000	28,913	32,500	31,000	29,529	28,750	31,667
66,667	53,333	47,500	66,875	47,500	62,500	62,027	51,667	51,250	66,395	70,789	68,889
53,125	47,105		56,875	45,000	47,500	50,296	43,947	46,667	52,391	55,429	57,206
40,000	37,500	40,000	47,000	35,000	55,000	43,500	41,500	37,273	44,390	45,571	46,562
37,500	33,571		38,846	32,500	36,250	36,250	40,000	30,455	38,448	35,556	39,444
28,750	23,125		37,273	25,000	25,000	26,875	30,000	26,875	30,182	29,038	31,176
58,333	49,231	47,500	58,750	40,000	55,000	40,000	46,154	51,667	51,630	60,000	64,500
60,000	46,429		54,231	43,750	55,000	55,556	41,538	48,333	57,000	62,258	61,852
43,750	36,786		49,000	36,250	55,000	41,071	39,000	33,182	39,189	45,625	47,857
52,000	51,786		69,000	55,333	78,000	45,962	47,778	51,364	60,000	66,818	66,765
47,500	42,143		50,000	40,000	55,000	46,136	46,000	46,429	46,207	48,500	50,781
43,750	43,000	40,000	47,500	40,000	55,000	36,846	35,714	43,750	45,000	44,412	47,941

THE PC BIG 50

1990

A handful of world-class suppliers builds and ships the vast majority of PCs sold worldwide. But a large school of smaller fish is playing a direct-marketing game that some users find hard to resist.

BY PAUL PINELLA

In the 10 years following the introduction of the IBM PC, the personal computer has blossomed into a megabillion-dollar business that continues to redefine information systems worldwide. Today, it's difficult to tell who's not in the PC business. Practically every major computer company worldwide sells a PC product line of some

kind, as do literally hundreds of smaller firms.

In an effort to pinpoint who's on top, DATAMATION recently surveyed several hundred computer companies of all sizes. A form was sent to the chief financial officer, controller or marketing contact at each company's U.S.-based office. It asked for 1990 corporate revenue figures, PC revenues, number of

DATAMATION's Big 50 PC Companies (Worldwide)

1990 RANK	COMPANY	1990 PC REVENUE	1990 IS REVENUE	% PC REVENUE	1990 IS EMPLOYEES	IS REVENUE PER EMPLOYEE	CIRCLE NO.	1990 RANK
1	IBM	\$9,544.00	\$69,820.00	14%	373,816	\$184,636	250	20
2	Apple Computer Inc.	\$3,845.80	\$5,740.00	67%	14,328	\$400,614	251	27
3	NEC Corp.††	\$3,620.00	\$18,407.50	27%	87,700	\$355,637	252	28
4	Compaq Computer Corp.	\$3,598.00	\$3,598.00	100%	11,300	\$318,407	253	29
5	Toshiba Corp.‡	\$2,985.30	\$5,169.20	48%	71,921	\$71,879	254	30
6	Ing. C. Olivetti & Co. SpA	\$1,791.70	\$6,414.50	28%	53,679	\$119,497	255	31
7	Fujitsu Ltd.	\$1,419.60	\$14,196.20	10%	N/A	N/A	256	32
8	Unisys Corp.	\$1,181.00	\$9,302.00	13%	69,200	\$134,422	257	33
9	Compagnie Des Machines Bull	\$1,142.30	\$5,349.80	16%	N/A	N/A	258	34
10	Commodore International Ltd.	\$995.70	\$995.70	100%	3,200	\$311,156	259	35
11	Intel Corp.	\$860.00	\$860.00	100%	N/A	N/A	260	36
12	Tandy Corp.	\$850.30	\$1,214.70	70%	N/A	N/A	261	37
13	Nov Inc.	\$799.00	\$799.00	100%	5,711	\$131,601	262	38
14	Hitachi Ltd.	\$718.40	\$9,604.10	7%	N/A	N/A	263	39
15	Sequent, Microsoft International Corp.	\$712.70	\$712.70	100%	51,132	\$13,927	264	40
16	AT&T	\$700.00	\$2,900.00	24%	11,400	\$254,386	265	41
17	Seiko Epson Corp.##	\$636.20	\$1,590.70	40%	N/A	N/A	266	42
18	Hewlett-Packard Co.	\$625.00	\$9,300.00	7%	91,000	\$102,196	267	43
19	Wang Corp.	\$623.30	\$623.30	100%	14,970	\$219,365	268	44
20	Dell Computer Corp.	\$546.20	\$546.20	100%	1,863	\$293,183	269	45
21	AST Research Inc.	\$516.20	\$566.50	91%	2,512	\$253,676	270	46
22	CompuAdd Corp.*	\$515.60	\$515.60	100%	1,500	\$343,733	271	47
23	Packard-Bell	\$500.00	\$500.00	100%	1,000	\$333,333	272	48
24	Amstrad PLC	\$499.10	\$518.70	96%	1,076	\$482,063	273	49
25	Acorn	\$44.00	\$5,617.00	1%	N/A	N/A	274	50

NOTES

Revenue figures are in \$ millions. IS revenues per employee figures are in \$
Revenue figures have been adjusted, where necessary, to represent
calendar year 1990.

* Privately held

† DATAMATION estimate

†† Includes revenues from NEC Technologies Inc.

‡ Includes revenues from Toshiba America Information Systems Inc.

Includes revenues from Zenith Data Systems

Includes revenues from Epson America Inc.

*** Includes revenues from Acer America Corp.

**** Includes revenues from American Mitac Corp.

s sold
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CIRCLE NO.	1990 RANK	COMPANY	1990 PC REVENUE	1990 IS REVENUE	% PC REVENUE	1990 IS EMPLOYEES	IS REVENUE EMPLOYEE	CIRCLE NO.
250	26	Canon Inc.	\$426.80	\$4,040.10	11%	N/A	N/A	275
251	27	Tandon Corp.	\$418.50	\$421.80	99%	1115	\$378,296	276
252	28	Mitac International Corp.	\$416.00	\$440.00	95%	1710	\$257,310	277
253	29	Ricoh Co. Ltd.	\$373.00	\$2,331.30	16%	N/A	N/A	278
254	30	Wang Laboratories Inc.	\$360.00	\$2,363.00	15%	20184	\$117,073	279
255	31	Atari Corp.	\$325.70	\$325.70	100%	1200	\$271,417	280
256	32	Nokia Data AB	\$304.50	\$1,279.90	24%	7719	\$185,312	281
257	33	Gateway 2000*	\$275.00	\$275.00	100%	1050	\$261,905	282
258	34	Digital Equipment Corp.	\$250.00	\$13,072.00	2%	121100	\$107,944	283
259	35	Everax Systems Inc.	\$248.00	\$427.60	58%	2597	\$164,652	284
260	36	Memorex Telex NV	\$213.30	\$1,951.20	11%	9380	\$208,017	285
261	37	Northgate Computer Systems Inc.	\$203.40	\$203.40	100%	697	\$291,822	286
262	38	Mitsubishi Electric Corp.	\$201.30	\$1,830.10	11%	N/A	N/A	287
263	39	DTK Computer Inc.	\$200.00	\$200.00	100%	1000	\$200,000	288
264	40	Goldstar Co. Ltd.	\$195.50	\$391.00	50%	N/A	N/A	289
265	41	Wyse Technology*	\$175.00	\$460.00	38%	2000	\$230,000	290
266	42	Advanced Logic Research Inc.	\$172.00	\$172.00	100%	600	\$286,667	291
267	43	Omron Corp.	\$167.90	\$291.30	58%	649	\$448,844	292
268	44	Mitsubishi Electric Industrial Co. Ltd.	\$164.10	\$4,101.80	4%	N/A	N/A	293
269	45	International Computers Ltd.	\$159.00	\$2,862.90	6%	21141	\$135,419	294
270	46	Transtek Corp.	\$150.20	\$593.40	25%	3000	\$197,800	295
271	47	Leading Technology Inc.	\$150.00	\$150.00	100%	200	\$750,000	296
272	48	Tritek Corp. Ltd.	\$144.89	\$144.89	100%	N/A	N/A	297
273	49	Zeos International Ltd.	\$127.10	\$127.10	100%	597	\$212,898	298
274	50	Ellie Computer Inc.	\$125.00	\$125.00	100%	N/A	N/A	299
Total PC Revenues			\$45,230.19					

THE PC BIG 50

1990

employees and related information. The data resulting from this survey, along with information taken from company reports, ongoing DATAMATION research and other sources, constitute DATAMATION's first listing of the Big 50 PC suppliers.

Many of the companies are privately held and declined to reveal certain financial statistics. A number of firms keep their number of IS employees a closely guarded secret. For others, the information represents a DATAMATION estimate based on the data that were supplied. A few companies that grew amazingly fast during 1991, recession notwithstanding, simply were not in business during all of 1990 and therefore have been excluded from this study, which is based only on calendar year 1990 revenues.

Because the top 50 worldwide suppliers are, of course, not necessarily also the top suppliers into the United States, a second chart is provided of the U.S. market. This represents DATAMATION's best view of the U.S. landscape in terms of PC revenue and units shipped. Data were drawn from an ongoing survey of DATAMATION readers' purchasing patterns called the "Brand Preference Study," conducted by DATAMATION parent, Cahners Publishing Co., as well as from DATAMATION 100 research into the top 100 computer firms worldwide, company reports and other sources.

The top 50 suppliers worldwide sold over \$45 billion worth of PCs in 1990. Among these 50 players, four big fish stand out: IBM, Apple Computer Inc.,

NEC Corp. and Compaq Computer Corp. PC sales from these four firms alone constituted a healthy 45.8% of the PC 50 market last year.

The difference in revenue between the largest supplier on the list and the smallest is wide. Number one IBM reported over \$9.6 billion in PC sales compared with 50th-ranked Laser Computer Inc., which hauled in \$125 million. Smaller players dominate much of the list. Only nine companies managed to crack the \$1 billion barrier in PC sales. Direct marketers, mail order firms and other smaller companies make up much of the remainder.

Just being a large computer company doesn't guarantee vitality in PCs. Although IBM's success goes without saying, other mainstream computer suppliers must content themselves with a smaller piece of the pie. Digital Equipment Corp., is a good example. Digital is now taking steps to shore up its PC revenues with a bold new line of networked PCs introduced in 1991, but the company's 1990 PC revenues weigh in at a scant \$250 million—peanuts compared with much smaller PC-only firms like Tandem Corp., Packard Bell and Dell.

The Smaller Fry

Part of the success of these smaller players may rest on their greater efficiencies at marketing what has essentially become a commodity item. Dell, for example, was able to thrive in 1990 through masterful marketing. By keeping both prices and head count low, Dell cracked the half-billion dollar mark while setting aside less than 1% of its revenues for research and development. This stands in stark contrast to IBM and Digital, both of which invested more than 10% of their revenues in research.

Concentrating chiefly on sales and marketing as opposed to long-term engineering, many of the companies on the Top 50 have become virtual money machines. Revenue per employee—one way to gauge productivity—has always been high at Apple and Compaq. Both of these companies earned more than \$300,000 in revenue per employee during 1990. But a number of direct marketers look equally or more impressive by that measure, including Packard Bell (\$833,333) and CompuAdd Corp. (\$343,733).

For now, the common strategy of building reliable PCs based on Intel Corp.'s proven chip architecture seems to be working for the direct marketers. Dell, Northgate Computer Systems Inc. and Zeos International Ltd., for example, all manufacture products that often do well on user satisfaction surveys. Each has implemented support strategies by building up a base of in-house technical personnel.

How well those companies now thriving principally on price will be able to compete over the longer term is open to question. Since so many firms with look-alike products are chasing a limited number of dollars, a shakeout seems likely—particularly if the industry shifts to a new technology base, like reduced instruction set computing (RISC), that requires heavy R&D funding or a different mix of marketing channels.

—With research by Susan Meel

The U.S. PC Market

A DATAMATION estimate of U.S. PC revenues and shipments

1990 RANK	COMPANY	1990 U.S. PC REVENUE	U.S. PC UNITS
1	IBM	\$3,760.00	1,200
2	Apple Computer Inc.	\$2,230.00	618
3	Compaq Computer Corp.	\$1,900.00	411
4	Tandy Corp.	\$1,000.00	442
5	Toshiba America Information Systems Inc.†	\$800.00	320
6	Unisys Corp.	\$567.00	227
7	AT&T	\$560.00	224
8	Zenith Data Systems*	\$560.00	205
9	Intel Corp.	\$529.00	212
10	Hewlett-Packard Co.	\$387.00	155
11	Dell Computer Corp.	\$382.00	153
12	Epson America Inc.††	\$300.00	125
13	NEC Technologies Inc.‡	\$300.00	125
14	AST Research Inc.	\$299.40	132
15	Everex Systems Inc.	\$223.00	89
16	Northgate Computer Systems Inc.	\$191.00	50
17	Wyse Technology	\$186.25	36
18	Advanced Logic Research	\$163.40	66
19	Zeos International Ltd.	\$125.00	50
20	Club American Technologies Inc.	\$100.00	70

NOTES:

*Revenue rounded up to millions. PC shipments are in thousands.

† Digital Equipment Corp. (Hewlett-Packard Co.)

†† Epson Corp. (Epson Corp.)

‡ NEC Corp. (NEC Corp.)

Source: DATAMATION Brand Preference report, company reports

Canon's Performance

A replacement

Canon's Program in maintenance paper. In fact, Canon Co. Guaranteed

PCs & WORKSTATIONS

LAPTOP COMPUTERS

These first LCDs, known as passive-matrix LCDs, used reflected light and could be difficult to read because of low contrast and narrow viewing angles. To improve visibility, display makers added a light source behind the display—backlighting—and used “supertwisted” LCDs, which bend light at a wider angle.

A further improvement, called double supertwist, adds another layer of supertwist material, increasing contrast and providing a white image background. But additional layers of supertwist also increase the display's weight—something laptop users don't like. And even with all those improvements, supertwist LCDs can still produce poor contrast, slow response times and “ghost” images.

The solution was to embed three small transistors (usually thin-film transistors, or TFTs) behind each pixel, one transistor for each blue, red and green color the pixel can produce. The transistors boost power to the pixel and eliminate the need for multiplexing. When a pixel is turned on, it stays on until turned off. Each pixel can block or transmit light more fully. A much brighter backlight can also be used, producing a brighter screen and greater contrast. The result: contrast ratios as high as 100:1, about seven times brighter than the best passive-matrix LCDs.

These new active-matrix displays also have wider viewing angles (to 160 degrees or so) and faster response times (25 versus 250 milliseconds) than their passive predecessors. But they, too, are expensive. Manufacturers must apply thousands of thin-film transistors to a glass substrate to make an active-matrix panel. A total of 921,600 transistors are on the back of each new Toshiba active-matrix color display, for example. And it takes only one bad transistor or a shorted electrode pair to trash an entire active-matrix

Japan's Lead In LCDs

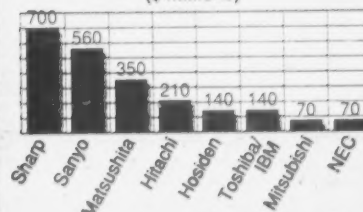
Japanese electronics firms are working furiously to develop better active-matrix displays for many lucrative applications. These include laptop computers, high-definition television (HDTV), scientific engineering workstations and medical instruments. U.S. firms, less willing to invest over the long term in the technology, are practically out of the running. While there are some U.S. companies left making flat panel displays, their products usually are not based on LCD technology. They are instead selling costly, specialized gas plasma or electroluminescent displays, mostly to the military.

This summer, the U.S. International Trade Commission (ITC) ruled that Japanese firms have been dumping flat panel displays in the United States at below-market prices, overwhelming U.S. firms that tried to compete. The ITC imposed stiff fines for importing LCDs and other kinds of flat panel displays. That will drive up the cost of imported LCD components used in laptops. It may also force U.S. laptop makers to assemble their products overseas. Indeed, Compaq Computer Corp.'s new Portable 486c laptop will be manufactured in Scotland, not Houston.

Because of their cost, flat panel displays are not likely to be used on desktop PCs until the mid-1990s. If public concern grows over radiation risks from long-term use of cathode ray tube (CRT) screens, however, flat panel alternatives could arrive sooner. The reason: flat panel displays emit far less radiation than their more conventional cousins. But, for now, the CRT remains the most economical desktop choice, despite all of its faults.

Japan's Big Bet On Flat Panel Displays

R&D funds for flat panel research (\$ millions)



Source: U.S. International Trade Commission

panel. That's kept production costs high and yields as low as 10 to 20%. Production has stabilized somewhat lately, but the yield problem still makes active-matrix displays costly.

Furthermore, only three companies currently make active-matrix panel displays: NEC, Sharp and Toshiba. And NEC

uses its displays for the most part only in its own machines, leading to availability problems for other computer vendors. IBM and Toshiba have a two-year-old joint manufacturing venture in Japan, Display Technologies Inc., that will be producing active-matrix displays. But it hasn't started production yet.

There are some noteworthy differences among the active-matrix displays currently available, mainly in terms of color palettes and numbers of colors displayed at the two main resolutions used: 640 x 480 and 320 x 200. Of the color laptops available at press time, only the NEC Prospeed 486 SX C and the new Compaq Portable 486c provide 256 simultaneous colors at 640 x 480 resolution. Both the high number of colors and that level of resolution are needed when an application requires the utmost in photo-realistic imaging, along with a large color palette. Some of the other displays are limited to 16 colors at higher resolutions, which is still fine for running the vast majority of applications, like, for example, Microsoft Windows.

Color Portables Shipping In 1991

The following companies are expected to be shipping color laptops by the end of this year:

Compaq Computer Corp.
Round Rock, Texas
Phone: 800-858-5800
Circle No. 325

NEC Technologies Inc.
Burlington, Mass.
Phone: 617-252-5000
Circle No. 326

Sharp Electronics Corp.
Melville, N.Y.
PO-8501 Colman
Circle No. 327

Toshiba America Electronic Corp.
Folsom, Calif.
Phone: 916-351-1000
15000 Shattuck Blvd., Suite 100
Berkeley, Calif. 94704
Circle No. 328

MARKET INSIGHTS

AN ANALYSIS OF ECONOMIC TRENDS

Roller Coaster —Or Tailspin?

BY MADELINE FRANCHI
Cahners Economics

Whoowee—the DATAMATION Information Systems Performance Indicator (ISPI) may not be in a free fall, but it sure is beginning to feel like it. The ISPI surprised us again in late summer, falling from 92.6 in July to 92.5 in August. Although the decline was slight and came during the traditionally slower summer months, it nevertheless crushed prospects for any vast improvement by the end of the final quarter of this year.

Peni-up demand may be sitting out there, but it has yet to be unleashed. New orders for information systems equipment tumbled 5.5% from July to August and 0.6% from August 1990. This contraction alone has helped to choke the ISPI, but the steadiness of the decline is the industry's biggest problem. New orders received by U.S.-based information systems manufacturers have dropped below year-ago levels in six out of the eight months from January through August.

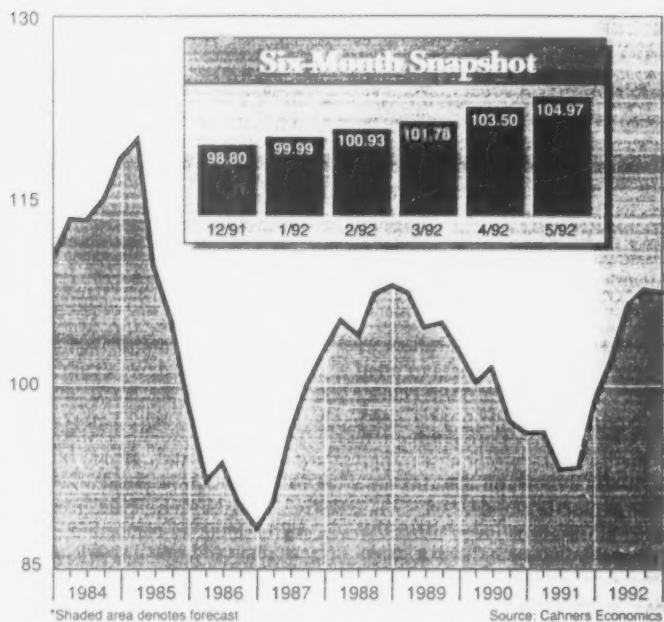
Cahners Economics expects new orders to be down in the third and fourth quarters of this year relative to 1990. That adds up to the IS industry's first annual decline in bookings since 1986 and will most likely keep the ISPI in the doldrums at least until the end of the first quarter of the new year, when we expect the IS industry to respond to capital-spending increases.

For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617)-630-2105, send him a fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington St., Newton, MA 02158.

Get ready for the upturn in 1992 with the "Cahners 1992 Economic Outlook." This 50+ page report features forecasts for the general economy, as well as for more than 30 industrial and service industries. Available December 15, 1991. Readers of DATAMATION can order the report, regularly \$75, for only \$21 by sending a check with your name and address made out to Cahners Economics, P.O. Box 59, New Town Branch, Boston, MA 02258-9908.

The IS Performance Indicator

When's the lift-off for IS?



	August 1991	July 1991	% Change 8/91-7/91	August 1990	% Change 1990/1991
■ Information-Processing Equipment					
Shipments (SA, \$ billions)	9.40	9.57	-1.7	9.43	-0.3
New Orders (SA, \$ billions)	8.87	9.40	-5.5	8.94	-0.6
Unfilled Orders (SA, \$ billions)	27.25	27.77	-1.0	28.10	-3.0
Inventory (SA, \$ billions)	15.44	15.75	-2.0	17.20	-10.2
■ Computer Production Workers					
Employment (NSA, thousands)	262.9	264.7	-0.7	277.6	-5.3
Average Weekly Hours (monthly avg.)	41.0	40.2	2.0	41.4	-1.0
■ Stock Index					
S&P's Computer Systems Stock Price Index	168.0	164.3	2.3	162.7	3.3
■ Contracts & Orders					
New Plant & Equipment (SA, \$ billions)	39.1	32.0	22.4	39.9	-1.8

SA= seasonally adjusted.
NSA= not seasonally adjusted

Source: U.S. Commerce Dept. Standard & Poor's, forecasts: Cahners Economics

MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

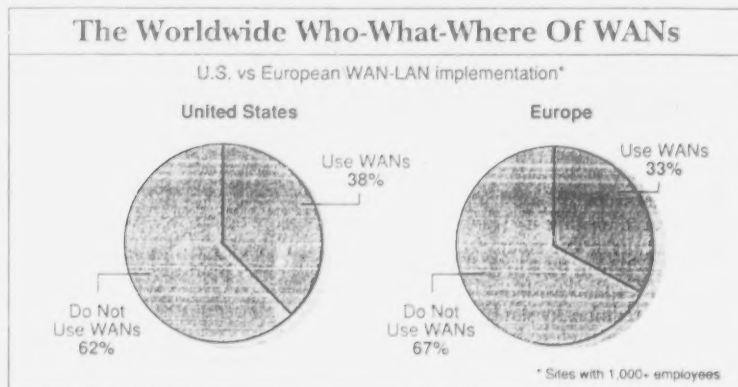
The World's IS Wises Up To WANs

BY WARREN CHILDS AND
KATHRYN A. TITO
Business Research Group

European IS operations are implementing new communications technologies at nearly the same rate as their U.S. counterparts. That's the conclusion of recent surveys by the Business Research Group of over 900 MIS professionals in *Fortune* 1,000 companies located on both sides of the Atlantic.

In Europe and the United States, for example, a strong minority of users—38% in the U.S. and 33% in Europe—are now using wide area networks to interconnect local area networks at remote sites. By using WANs to connect LANs, these users' companies are putting into place the technology required to perform client/server applications on a multisite or enterprisewide level.

Several European nations lead the U.S. in implementation of WANs. For example, 50% of users in France and 42% in Britain report using WANs to interconnect LANs. However, in European coun-



tries where the communications infrastructure is less developed (Spain) or more highly regulated and costly (Italy), WAN use is considerably lower.

In fact, telecommunications services are not uniformly available throughout Europe and can be prohibitively expensive across borders. Most government-owned telephone companies in Europe place some additional restrictions to ensure use of the local manufacturers' telecommunications equipment regardless of cost or, in some cases, even regardless

of equipment compatibility.

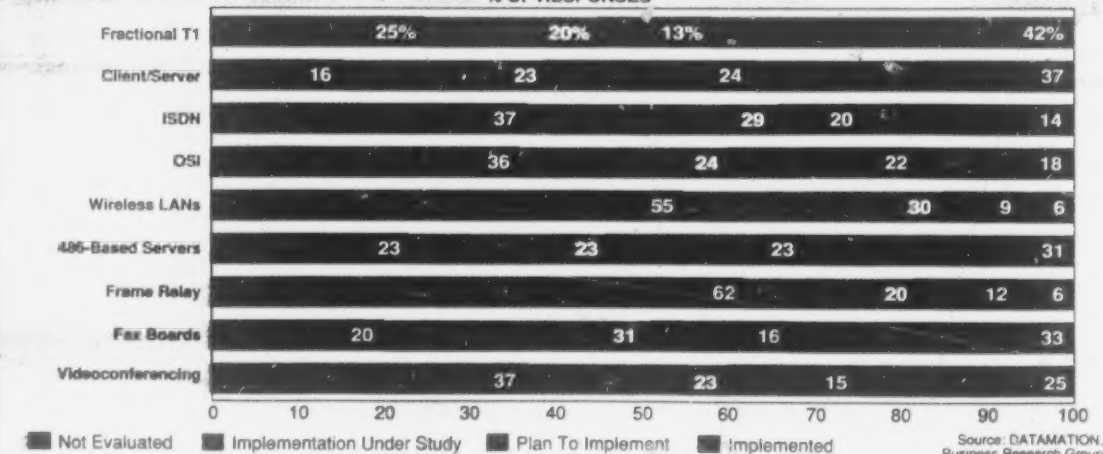
To reduce some of these restrictions, European LAN and WAN users are still waiting for the long-promised telecom deregulation, now slated for some time in 1992, to take effect throughout the European Economic Community.

For more information, call Nancy Finn at (617) 964-6204, send her a fax at (617) 558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

DATAMATION's Technology Implementation Index: Networks/Communication

DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

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David Thacher,
senior product manager,
Network Business Unit,
Microsoft Corp.,
with LAN Manager 2.1



DECEMBER 15,
1991

DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

VOLUME 37
NUMBER 25



The tangled web of network operating systems has left the future of LAN Manager in doubt.

COVER STORY

NETWORKS

LAN Man: Is There Life After OS/2? 20

BY TOM McCUSKER

Microsoft has added solid features to LAN Manager 2.1, but its latest network operating system is eclipsed by talk of Windows NT and the goal of a common server and client environment.

Cover photography by Brian Drake

EXCLUSIVE

The 1992 International User Group Directory 65

BY SUSAN MAEL

Our fourth directory holds more than 200 user group entries, up from 180 the previous year. They are listed alphabetically by user group, with a cross-reference index at the end.

PRODUCT GUIDE

FEATURE

Color Laptop Saves Power 43

BY SARA H. LINDSEY

Users who wanted color and light weight had to settle for one or the other. Until now, that is.

Epson's Weisman enjoys low weight and battery operation with the NB-SL notebook.



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MIS Buys Into Mail Order 27

BY LEE THE Office supply and office equipment industry is just hanging in. But it's not from the manufacturers. More, it's from the mail order companies that are taking a bite out of the industry's lunch.

NETWORKS

TERMINAL EMULATION

Automate Mainframe Links With Windows 33

BY NED SNELL Window's terminal emulation software lets you link the connectivity provided from windows. With mainframe and DB2, you can turn word processors and spreadsheets into tools to present mainframe data.

SOFTWARE

ARCHITECTURES

AS/400 Moves Out Front With SAA 39

BY MIKE RICCIUTI Mainframe Systems (MIS) has chosen the AS/400 SAA version. When IBM ships a major upgrade of the AS/400's operating system, Mainframe Systems' mainframe system will suddenly become the company's flagship SAA product.

SYSTEMS

SERVICE

How Expert Systems Keep You Running 41

BY ELAINE L. APPLETON Companies are not alone when a DARD address is not what an IBM AS/400 Series' components are mastering the art of predicting hardware failures—and avoiding them.



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Harley-Davidson's Kolbe thought he'd "let it rip" along the mainframe route, but found the AS/400's lower price and greater flexibility really revved his engines. page 39.

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COVER STORY

NETWORKS

Microsoft has added solid features to LAN Manager 2.1, but its latest network operating system is eclipsed by talk of Windows NT and the goal of a common server and client environment.

BY TOM McCUSKER

If you are running Microsoft LAN Manager, or a private label variant like IBM's LAN Server, are you at a dead end?

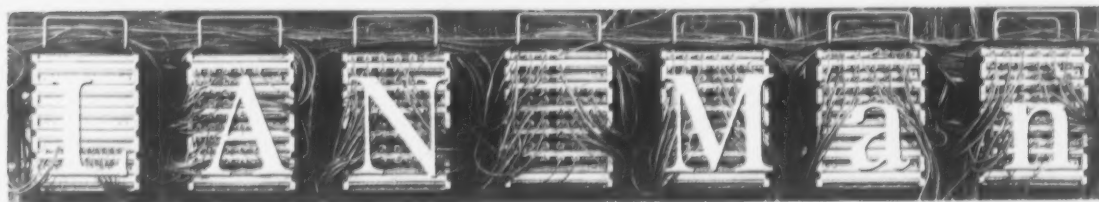
The question has come up because, for the first time since MS-DOS swept into dominance 10 years ago, the future of PC operating systems is unclear. IBM has chosen the 32-bit OS/2 2.0 route for the near term, with the Apple Pink project to follow. Microsoft Corp. is going its own 32-bit way with Windows NT. Where does this leave the users of LAN Manager, designed to run on the 16-bit OS/2 1.31, when the new operating systems come into the market over the next one to three years?

In many users' minds, LAN Manager, OS/2 and SQL Server formed a three-legged stool of network operating system and database software on which to build client-server network applications that would go beyond what Novell Inc.'s NetWare has

to offer. But the well-publicized divergence of Microsoft and IBM over OS/2, and Novell's stronger technical and corporate links to OS/2, have now called into question the place of LAN Manager in corporate networks.

The question is especially timely in view of the release of LAN Man 2.1 this month, which Microsoft says fills many of the gaps in version 2.0. At the same time, Microsoft has clearly indicated its intention to chart a new course in desktop operating systems, away from OS/2, with its own successor to DOS, Windows NT (for New Technology), which is essentially Windows's user and application programming interfaces grafted onto a new 32-bit core operating system. Company executives discussed with DATAMATION the likely impact of NT on LAN Manager users and on networking in general.

"We see a great opportunity [with NT] of tying the



Is There Life After OS/2?



MICROSOFT'S THACHER: The major server applications will be available for Windows NT

desktop to the server much closer than it ever has been before," says Mike Murray, who heads Microsoft's network business unit. He foresees that "thousands" of new Windows applications will be written over the next two years as Windows continues to achieve stature as the de facto standard desktop operating environment.

Small Steps For LAN Man

But there is concern among some LAN Manager users that NT puts the LAN Manager product on unsure footing. Windows NT is expected to usurp many network functions that are now offered as LAN Manager. One potential scenario, in fact, leaves LAN Manager as just that: a utility for network management, with the real network contained, instead, inside Windows NT. So far, Microsoft has not made that kind of definitive decision, but there is no question that some of LAN Man's current functions will be removed and placed within the base NT operating system. Does this trend signal the death of LAN Manager as a discrete network operating environment? Here's what Microsoft executives say:

- At least through 1993, LAN Manager servers will run on top of OS/2, as well as on the UNIX operating system, Digital Equipment Corp.'s VMS and Windows NT. That's the promise by Paul Maritz, vice president of advanced operating systems.

- For users who are committed to OS/2, Microsoft will ship an OS/2 2.0 client for LAN Man when that becomes practical (IBM has indicated its OS/2 2.0 will ship in the first quarter 1992). As for an OS/2 server version of LAN Man, David Thatcher, senior product manager with Microsoft's Network Business Unit, says: "We plan to keep moving the LAN Manager product on OS/2, and that definitely does include moving it to OS/2 2.0 as soon as OS/2 2.0 becomes a viable server platform. So, a) it's [OS/2 2.0] got to ship and b) we've got to make sure it's bug-free as the current 1.3 version. We also have to do the work that we've done with 1.3 to make sure it [LAN Man] supports hundreds of server platforms."

Making The Move

Microsoft executives point out that existing LAN Man customers don't have to migrate to Windows NT if they like the OS/2-based version. But those who opt to move should find the going relatively easy, they say.

Large outside software vendors will port their server applications to NT as will Microsoft with its SQL Server and Communications Server, its alternatives to IBM's OS/2 Database Manager and Communications Manager, respectively. "The major server applications will be available for Windows NT," declares Thatcher.

Microsoft will offer corporate customers what are called "OS/2 API subsystems" for Windows NT. These are small subsystems that will enable OS/2-based server applications to run on Windows NT with little or no change. Thatcher says Microsoft actually has an OS/2 version of SQL Server today running on an OS/2 subsystem for NT in a laboratory environment in Redmond, Wash.

At present, there are only 16-bit APIs for OS/2. Microsoft's 32-bit APIs for NT will be released when NT is, Thatcher says.

Microsoft believes these issues primarily affect server applications. Applications that are workstation- or client-based do not need to be migrated from OS/2 to Windows NT.

Scott Sawin, a senior systems engineer with MicroAge of Exton, a reseller and integrator of network operating systems in Exton, Pa., and a franchise of MicroAge Computer Centers Inc. of Tempe, Ariz., says he's advising clients not to be concerned about migrating LAN Manager to an NT platform on the server. "I wouldn't find that to be much of a concern because there's not going to be too many hardware requirement changes as well as software changes," says Swanson. The important thing is being able to log into the server from your OS/2, DOS and Windows workstations, he adds.

There are LAN Man users who can hardly wait for LAN Man over Windows NT. Tom Bernhardt, applications network consultant with Star Enterprise, an \$8 billion Houston oil refiner and marketer with a 15-server, 600-node LAN Man network, thinks LAN Man will get a lot better when it's on the NT Windows platform. "Not that what we have now is bad. It's clear, though, to see how things can get an awful lot better. I'm actually excited about that NT change," says Bernhardt. Other users were less than overjoyed, feeling that they had been led down a dead end by Microsoft's initial advocacy of OS/2.

Ultimately, performance may tell the tale. Because Windows NT will provide the same environment at both the server and client level, Thatcher envisions increased productivity by software developers: what is written for the network could also run on either the desktop or the server. That will help the training process since customers won't have to learn multiple user interfaces.

Whether Microsoft can gain acceptance of NT and fulfill Thatcher's vision remains to be seen. In the meantime, LAN Man version 2.1 fills out the gaps in LAN Man 2.0, says Murray.

DATAMATION IN FOCUS LAN Manager 2.1

Microsoft Corp.
Redmond, Wash.
Price: 10-user version on a single server: \$1,995 (includes OS/2 version 1.31, core code, NetWare interoperability, integration with Windows 3.1, TCP/IP and support for SNMP and NetView agents). Additional 10 users per server: \$995. Unlimited Users: \$5,495.
Circle No. 200 on Reader Card

Value-Added Packages

LAN Remote Access Service: \$1,995 (per server); MS Services for Macintosh: \$995 (per server); Toolkit for Visual Basic: \$135; TCP/IP utilities for LAN Man (workstation-based terminal emulation and file transfer utilities): \$195 (per workstation); 3Com interoperability toolkit: \$149 (per server)

System Requirements

- **Servers:** PC with 80286 or later microprocessor; 5MB of memory, but additional memory will enhance performance; VGA, EGA or compatible adapter and monitor.
- **Clients:** Can be either MS-DOS (or PC-DOS), Windows 3.0 or OS/2 (version 1.21 or later). Memory requirements are basically what the specific operating environment needs.

Source: DATAMATION, company reports

December 15, 1991

COVER STORY

NETWORKS

Its new features will provide interoperability between LAN Man and both NetWare and AppleTalk servers. The new version will provide the Transmission Control Protocol/Internet Protocol (TCP/IP) common transport. It will also provide users with the ability to dial up the network from remote locations and use LAN Man services as if the users were on the network.

Microsoft, which a year ago said it expected to spend nearly \$5 million in outside software to make the improvements for version 2.1, actually spent far less. That's thanks to the Demand Protocol Architecture (DPA) technology it got from 3Com Corp., which was the major original equipment manufacturer (OEM) for LAN Man until it abandoned software

development in 1990. DPA is the basis for the NetWare and AppleTalk interoperability.

Microsoft acquired the TCP/IP service from Hewlett-Packard Co. and developed the remote dial-up service in house. The remote access feature can accommodate small branch offices or laptop users. Unlike many of the remote control software products on the market, Microsoft's implementation makes remote connections full-fledged participants on the LAN. Users connect through a server, not just by taking over the keyboard of an individual station.

In addition, automatic-tuning features have been added in the latest version to make the product easier to use. For example, Microsoft has hidden from the users many of the 45 parameters that customers can change when configuring LAN Manager. Only 7 or 8 are visible now. The "autotuning" feature instructs the server to continually monitor the constantly changing characteristics of a growing network and to automatically optimize the number of file handlers or buffers it has available, thus

keeping LAN Man always in tune.

Other 2.1 features:

- A DOS-based package for LAN administrators who want to work from a DOS workstation; to do so now, they must use the command line. Replicas of the network interface from OS/2 are being offered to these administrators by using character-oriented windows on DOS.
- LAN Manager toolkit for Visual Basic. This is a scripting language that Microsoft has written to allow people to access LAN Manager APIs more easily from Visual Basic.

DATAMATION

IN FOCUS

LAN Manager 2.1

Key Benefits For IS

- LAN Manager networks can now accommodate Macintosh and UNIX clients.
- LAN Manager clients can now also be NetWare clients.
- Remote sites can be more readily tied into LAN Manager networks.



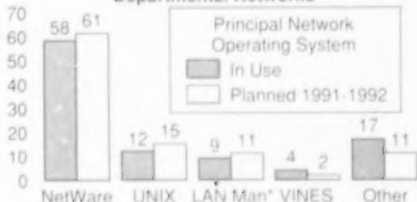
Source: DATAMATION company reports.

December 15, 1991

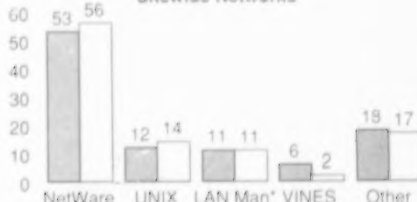
Which Networks You Are Choosing?

Two recent surveys of DATAMATION readers show Microsoft making little headway with LAN Manager against market leader Novell, or even UNIX...

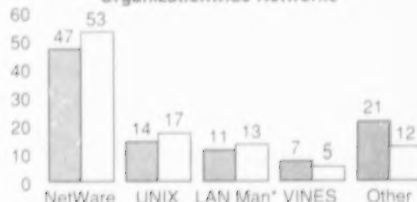
Departmental Networks



Sitewide Networks



Organizationwide Networks



...While trailing several vendors in customer satisfaction **



* Includes all OEM variants.

** Index based on ratings from 1 to 10, 10 highest.

Source: DATAMATION

■ 3Com interoperability toolkit: This will enable users of 3Com's 3+ Open (the most popular OEM version of LAN Man) to make the transition to Microsoft LAN Manager.

These interoperability features should ease some users' fears that LAN Man is a blind alley. LAN Manager servers can now be more readily integrated with other LAN operating systems, as well as with a broader range of clients. For users whose commitment to OS/2 makes them question a continuing commitment to LAN Manager, these features may postpone the need to make that decision.

That's how one major research firm that processes megabytes of critical data daily on a LAN Manager network looks at the new interoperability features. Starters at the firm had built a number of applications on OS/2 and are quite disturbed at Microsoft's turn away from it. Dismayed at the prospect

For the first time since MS-DOS swept into dominance, the future of PC operating systems is in doubt.

of being caught in the crossfire between IBM and Microsoft, they are seriously evaluating a switch to UNIX servers. By utilizing the TCP/IP transport with LAN Manager, they can gradually make the transition to UNIX servers if and when they decide to do so.

Pushing Harder

Like virtually every LAN vendor besides Novell, Microsoft must answer as many questions from users about its installed base as about technical performance. The company has built up a staff of "several hundred" salespeople calling on *Fortune* 500 type accounts. And it has formed a consultants' organization of about 100 persons who provide various software and related technology consulting services to corporate accounts for a fee. Thatcher said Micro-

soft will recommend these consultants to LAN Manager users who wish to move server applications to Windows NT platforms.

This kind of marketing clout could just give LAN Manager the edge it needs to be a key player in a segment of the desktop market that so far has eluded the tenacious Microsoft. "We've had to play catch-up in networking for the last four to five years," says Murray.

Still, some analysts see NetWare and UNIX becoming the escape hatches for many users caught in the IBM-Microsoft rift and unwilling to bet on system software that may not be around in three years. After all, even OS/2 is no longer a sure thing in that time frame, as IBM romances Apple and the Pink operating system. □

What About LAN Server?

IBM's LAN Server is among the most widely used of the original equipment manufacturer (OEM) versions of Microsoft Corp.'s LAN Manager network operating system. There have always been incompatibilities between LAN Server and LAN Manager, but in recent years, users had grown to expect that the two would eventually merge. Instead, merging has given way to what IBM calls "convergence," and thereafter users can expect divergence, as IBM heads off toward a model based on the Open Software Foundation's Distributed Computing Environment (DCE). IBM product marketing officials have detailed for DATAMATION what they have provided in the latest release of LAN Server and where they are headed with that product.

According to Jeanine J. Roadhouse, IBM's senior planning manager for Personal Systems Programming in Austin, Texas, LAN Server 2.0 "is equivalent to the currently shipped LAN Manager 2.0" in features. As for compatibility, "this release is functionally and API converged with LAN Manager." Roadhouse says that customers basically wanted interoperability and applications portability between LAN Manager and LAN Server, and that LAN Server 2.0 provides that, with one exception: peer services, which IBM considers a security risk.

Roadhouse says, "the affinity between the two products is still sufficient so that if, for example, in the same domain you want to run a LAN Manager LAN and a LAN Server LAN, a LAN Manager client can log onto the LAN Server and can use the resources of the LAN Server. Essentially, we interoperate very well."

Roadhouse admits, however, that "it's not quite as clean going the other way. For example, an OS/2 LAN requester cannot log onto a LAN Manager server. It has to log onto its own server. Once it's logged on, however, then it can access the LAN Manager server and use some of its services. And that's because we [LAN Server] manage both users and resources; LAN Manager and their administration only manages users. Our requesters are looking for some information from the domain controller that LAN Manager doesn't provide."

Advanced Server Features

As for specific features in the new version of LAN Server, Barbara A. Barker, advisory programmer for IBM's Entry Systems Division, says one of the key improvements is in the advanced server option, which is an implementation of the High Performance File System for 80386-based and later PCs. It's an installable file system designed to run in Ring 0, the most

privileged access to the Intel CPU, eliminating delays that occur when the current file system has to perform transitions from Ring 3 to Ring 0.

"This provides a very fast file-serving capability à la NetWare 3.11. It's a 386-specific implementation, it's written in assembler and it was intended to be run on the 16-bit operating system, OS/2 1.2." The file system has a common cache and does some contiguous allocation of information. It also gives users a 32-bit I/O data path. A full 32-bit version of the file system for OS/2 2.0 is being written from scratch and will not come out until next year. The installable file system also provides a way to upgrade to a multiprocessor version of LAN Server, something IBM has demonstrated but not commercialized.

LAN Server cannot yet take advantage of any of OS/2 2.0's object-oriented interface. When LAN Server is rewritten to OS/2 2.0, Roadhouse says, the first implementation of those features will probably be drag-and-drop network printing through the OS/2 2.0 Workplace Shell.

IBM has added its own implementation of fault tolerance, including disk mirroring and disk duplexing. In the area of security, the server now has local security, which means that users' rights apply at the server, protecting it from users with low-level rights. It also means that administrators can assign limited rights to operators to perform limited functions on the server.

As for the future, IBM's contractual rights to LAN Manager code ended with LAN Manager 2.0. Roadhouse insists that this, and the firm's agreement with Novell Inc., does not mean the end of the LAN Server product line. On the contrary, IBM intends to move LAN Server toward distributed-computing capabilities, possibly as a scaled-down version of the OSF's DCE.

Roadhouse does say that IBM's agreement with Novell will result in NetWare for OS/2, as well as a migration tool to switch servers over from OS/2 to NetWare. IBM has consistently stated publicly that both LAN Server and NetWare have their places (enterprise and work group, respectively), but one well-placed analyst claims that Big Blue salespeople are in fact given greater incentives to sell NetWare, a sure indication of where IBM is placing its bet.

Roadhouse nonetheless asserts that IBM remains committed to LAN Server. She estimates that IBM will support LAN Server 2.0 for at least two or three more years, with further releases during that time. And, oh yes, LAN Server's client software will not only do OS/2 1.3, 2.0, and DOS but Windows 3.0, as well—all for \$75 per client.

—Mark Schlack

In many firms, the old saw that "Nobody ever got fired for buying IBM" is being replaced by, "What has MIS done to save money lately?" Where buying PCs is concerned, a growing number of PC managers are responding by buying PC compatibles directly from other manufacturers by mail order.

A significant portion of even the largest firms now say that they primarily purchase PC hardware direct, bypassing the more traditional computer store dealer or manufacturer's rep. This minority ranges from 25% of large firms with revenues over \$750 million on up to 35% of firms earning less than \$10 million in revenue, according to the fall 1991 DATAMATION/Cowen & Co. survey of readership buying patterns. This same survey also shows a steady increase in respondents' plans to buy through this economical channel in the coming year.

So what's behind the trend? Clearly, it has taken more than cut rate prices to make buying direct legitimate for corporate purchasers. The following items stand out:

- **The leading mail order firms now build reliable, 100% IBM PC-compatible equipment.** PCs with Intel 80386 microprocessors have been around for a while now, and the 80486 is really just a 386 with several support chips built in. The technology is well understood. Meanwhile, simplified, efficient and highly reliable chip technology keeps trickling down into PCs offered by even the more obscure mail order vendors.

- **Most mail order PC manufacturers now offer on-site service,** either directly or through third-party firms such as TRW's Customer Service Division. As PCs become more reliable, however, many PC managers say the need for on-site hand-holding via third-party maintenance support is diminishing.

- **Subsystems are easy to install and remove.** Troubleshooting for today's PC hardware generally involves nothing more complicated than component pop and swap, since in most cases modular components are cheaper to replace than to repair. The conversion to single in-line memory modules (SIMMs), for example, has greatly simplified memory upgrades. Machines also feature standardized form factors, connectors and hole placements. This makes multiple sourcing practical.

- **Time and distance are no longer factors.** Federal Express Corp. and its ilk can now put vendor and seller together in one day almost anywhere in the United States and Canada if time-critical compo-

MIS Buys Into Mail Order

One out of four large corporations is purchasing its PCs direct from the manufacturer. Here's what some of them say concerning what to look—and look out—for in mail order machines.

BY LEE THE

nents need to be shipped. In most cases, vendors will send out replacement parts immediately, without waiting to receive the defective original. Without this kind of turnaround, it's likely that corporate America would still be extremely reluctant to use mail order.

Direct Order, Not Mail Order

In fact, the term *mail order* is a misnomer. No one really orders by mail; it's more typically done by telephone, fax and modem. Nor is shipment often by mail. "Direct order" most accurately describes this channel, in fact.

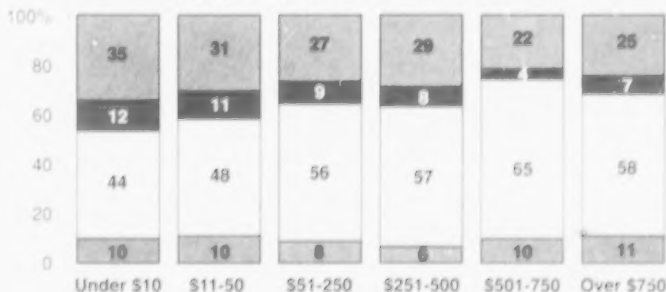
But at one point it was more like "direct disorder." Just a few years ago, Jeff Guess, a buyer specialist in purchasing for Thomson Consumer Electronics Inc.

(formerly RCA Corp.) in Indianapolis, ran into trouble while buying Zeos International Ltd.'s systems in quantity. According to Guess, the machines were fine, but the organization wasn't. He was buying 50 to 60 systems a month for 2,500 people, and the products were being directed to any of 200 loading docks. This made delivery something of a problem. If Zeos neglected to stamp a clear purchase order number on the packing slip, the PC would wind up getting shipped right back to the manufacturer.

The return rate for hardware defects was low. But Guess determined that the number of returns due to defective paper trails was unacceptably high. To make matters worse, Zeos was unable to provide a key account person or technical

Who's Buying Direct

A growing number of corporations are primarily buying their PCs direct from the manufacturer.



ORGANIZATION SIZE (1990 Revenues in \$ Millions)

☐ Direct From Manufacturer
 ☐ Mass Merchandiser
 ☐ Independent Resellers
 ☐ Other

Source: DATAMATION/Cowen & Co. Survey. All figures may vary with time due to rounding.

PCs & WORKSTATIONS

PURCHASING

support person to help Guess sort through the problems.

Fortunately, this story has two happy endings. Guess switched to alternative supplier Gateway 2000 and has been satisfied ever since. He reports only one bad power supply and one defective keyboard out of 200 machines purchased so far. In both cases, replacement units were sent out immediately. And Guess got an account person assigned to him, along with the solid paper trails he wanted. Gateway now automatically calls Guess and tells him when each order ships.

Guess is pleased with Gateway's product quality. He says the products have lived up to compatibility claims and are always delivered as-ordered with whatever options a user may require—including Ethernet and Token Ring networking hardware. His only complaint is that lead times between order placement and delivery can stretch out to as much as three or four weeks. But Guess says this is relatively common industrywide.

Ready For Prime Time

The second happy ending happened to Zeos, which has learned to match its company's performance to that of its machines. Zeos vice president of marketing Rick Apple explains that when Guess was having his Zeos troubles, Zeos had been featured on the cover of a major consumer computer magazine. Orders shot through the roof and overwhelmed the company's internal structure. But Apple reports that the company has grown up since then.

This was confirmed by Ruth Sadler, an administrative assistant with the Pfizer Specialty Minerals Group in Easton, Pa. She recently bought 40 386SX laptops for her group after another division of Pfizer Inc. reported success in buying from Zeos. Only one unit failed; it had a defective hard drive. "We returned the machine. They repaired it and sent it back immediately."

Sadler reports that one salesperson handles her account. "We fax a PO, get an approximate ship date, and it's usually right on the money," she says. "We were given close attention and follow-up, too." Zeos's Apple adds that all technical calls to support personnel are routed through a screener, who directs the call to a technician with special expertise in a particular area, such as OS/2, UNIX, networks or notebooks. Tech support is available around the clock, every day of the week. And Zeos provides an 800 number through which buyers can track their or-

ders at each point in the process, for example, finding out when the machines leave manufacturing or enter the shipping department.

Despite the high level of standardization of PCs, Zeos's Apple says his company tries to add value wherever possible. He cites the use of heavy-duty metal casings and the fact that the Federal Communications Commission has granted both Class B and U.I. approval of the entire computer, and not just the power supply. In addition, Zeos includes dual fans and full-width air intakes in all desktop and tower systems. The more typical left-side air slot placement becomes a problem, Apple claims, when us-

ers place desktop machines on the floor. The left-side slots tend to suck in lint and dust.

Some say that the quality control procedures put in place at leading mail-order vendors actually surpass those of some very large PC suppliers. Michael McDaniel, a communications and PC support administrator for SATCO, a storage tank company based in Tulsa, Okla., is a case in point. After extensive research into the financial health of various suppliers, including a Dun & Bradstreet credit check, McDaniel bought several dozen Gateway 2000 PCs. Says McDaniel: "It seems odd, but they don't fail as much as IBM's stuff. I came over from the service

10 Tips For Buying Mail Order PCs

1. **Insist upon FCC Class B certification of both motherboards and assembled systems.** This is a good indicator of overall product quality. U.I. listing and approval of the assembled system would be a plus.
2. **Remember that PCs are not quite commodity products. Make sure the systems chosen are suited to the exact uses intended.** For example, consider a tower design, if the system is going to be placed on the floor, and a heavy-duty power supply, if the system will be kept stuffed with extra boards and peripherals.
3. **Make sure that all components can be multiple sourced.** Even companies like Compaq Computer Corp. have in the past used high-priced proprietary power supplies and such. If a vendor does choose to use custom equipment, make sure that the proprietary item is truly useful—and that the company's financial position is solid. Tandon Corp., for instance, builds a proprietary removable hard drive that could be useful in some applications. And public companies, such as Northgate Computer Systems Inc. and Zeos International Ltd., can be verified for financial stability.
4. **Purchasing contracts should specify make and model of major components.** User-specified motherboards, video cards, monitors and hard drives, in particular, should never be changed without the buyer's prior approval.
5. **For better service, ask for a designated sales representative and support representative.**
6. **Require accurate purchase order tracking procedures.** Notification of the shipping date is a plus.
7. **Make sure that technical support is available during all hours and days of the week when service is likely to be required.** Some vendors' tech support organizations never close, so this is a reasonable expectation.
8. **Pick a vendor that builds the full range of PCs needed.** Some vendors have limited customization capabilities.
9. **Consider a mail order firm that also operates store chains.** CompuAdd Corp. is such a vendor, and it could become a positive factor if local support is an absolute requirement. But remember—corporate buyers generally report low failure rates for mail order machines.
10. **Prepare to negotiate with the powers that be.** Some users report that they are able to buy direct only after protracted struggles with MIS. MIS organizations should consider setting up pilot projects proactively so that they are prepared to move into this area quickly if need be.

side. They just don't." He's reported no failures in over a year.

Better Than Just As Good

He also has no trouble running the Gateways in a heavily networked environment, even when using them as file servers. McDaniel attributes this to Gateway's strong control over its own vendors, which prevents him from getting machines with the motherboard or disk drive du jour. "[Gateway] uses top-notch stuff like Micronics motherboards, Diamond Star VGA displays and assorted quality hard drives," he says.

☐ FEDERAL EXPRESS AND ITS ILK CAN NOW PUT VENDOR AND SELLER ONE DAY APART.

McDaniel doesn't think much of a possibly cheaper alternative: trying to assemble systems in house. "If you buy from a reputable mail order house, you've got that one-year pad [warranty], so you

don't have to worry. If something goes wrong, it isn't your problem."

PC managers doing business with even lesser known firms are singing the praises of mail order. Tuan Pham, a systems analyst for aerospace manufacturer Rohr Industries Inc. of Chula Vista, Calif., managed to get permission to buy 54 PCs from Micro Express after winning a protracted struggle with MIS. His information sys-

tems colleagues originally had insisted on IBM personal computers bought through ComputerLand Corp. Pham says Micro Express was "a lot faster, with much better order tracking."

Any MIS department that isn't running a mail order PC pilot project—at the very least—could be in for trouble when top management starts asking "What has MIS done to save money lately?" ☐

A Sampling Of Mail Order Suppliers

Respondents to the fall 1991 DATAMATION/Cowen & Co. survey of our readers' mini and microcomputer buying patterns named the following PC manufacturers as their suppliers:

Austin Computer Systems
Austin, Texas
Circle No. 300

Blackship Computer Systems Inc.
Fremont, Calif.
Circle No. 301

Bull Dog Computer Products
Martinez, Ga.
Circle No. 302

Club American Technologies Inc.
Fremont, Calif.
Circle No. 303

CompuAdd Corp.
Austin, Texas
Circle No. 304

Dataworld
Pico Rivera, Calif.
Circle No. 305

Dell Computer Corp.
Austin, Texas
Circle No. 306

Gateway 2000
North Sioux City, N.D.
Circle No. 307

Leading Technology Inc.
Beaverton, Ore.
Circle No. 308

Micro Express
Santa Ana, Calif.
Circle No. 309

Northgate Computer Systems Inc.
Minneapolis
Circle No. 310

PC Brand Inc.
Chicago
Circle No. 311

Swan Technologies
State College, Pa.
Circle No. 312

Tandon Corp.
Moorpark, Calif.
Circle No. 313

Zeos International Ltd.
St. Paul
Circle No. 314

Source: DATAMATION,
Cowen & Co.



Building integrated transportation software is easier when you've been down the road before.

When someone asks you about on-line freight schedules and logistics reports, we can help you get there quickly and cost-effectively. Our transportation management software is based on 10 years of transportation research, and is easily integrated into current systems. For more information, write to us at 10800 Lyndale Avenue South, Minneapolis, MN 55420 or call 1-800-888-6226.



Vocam Systems
A Pitney Bowes Company

Circle 10 on Reader Card

MARKET INSIGHTS

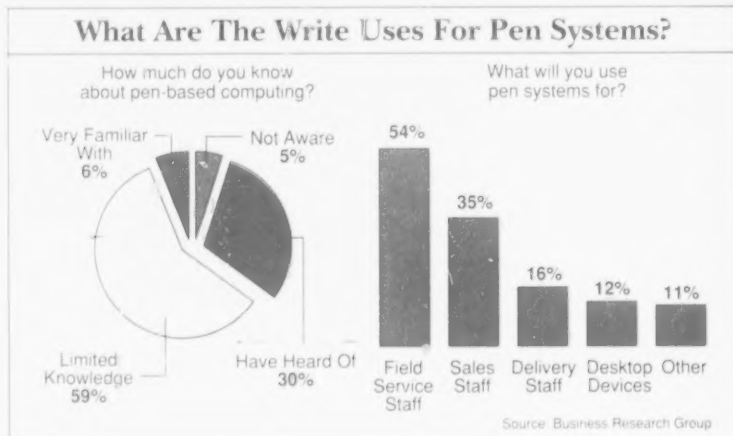
A SURVEY OF TECHNOLOGY TRENDS

Pen Computers: No Write Stuff

BY WARREN CHILDS
AND KATHRYN A. TITO
Business Research Group

Aggressive (and some say way too early) marketing efforts have successfully boosted the interest of potential end users in pen-based computing. In the latest survey of DATAMATION's Technology Panel, almost two-thirds of respondents say they already have at least some knowledge of the technology of pen-based microcomputing systems and its products. Only 5% of panel members were not aware at all of pen systems.

Not only are panel members highly aware of this new—and not yet available—technology, but nearly three-quarters already have strong ideas about the best ways to use it in their companies. Most panel members believe pen-based computers are a valuable new tool for their companies' mobile work forces. When asked to name what they believed would be the best potential uses for these systems, the top two applications cited were to support field service workers (54%) and sales staff (35%). A distant runner-



up candidate for pen-based systems was product delivery staff (16%). Only 12% expect pen systems to play a role in desktop office applications.

Among the throngs of vendors currently demonstrating pen systems are Dauphin Technology Inc., Grid Systems Corp., Microslate Inc., Momenta Corp., SCR Corp., Samsung Information Systems America Inc., and TelePad Corp. Most will ship products by mid-1992.

With users ready to place these systems in the hands of those workers who pro-

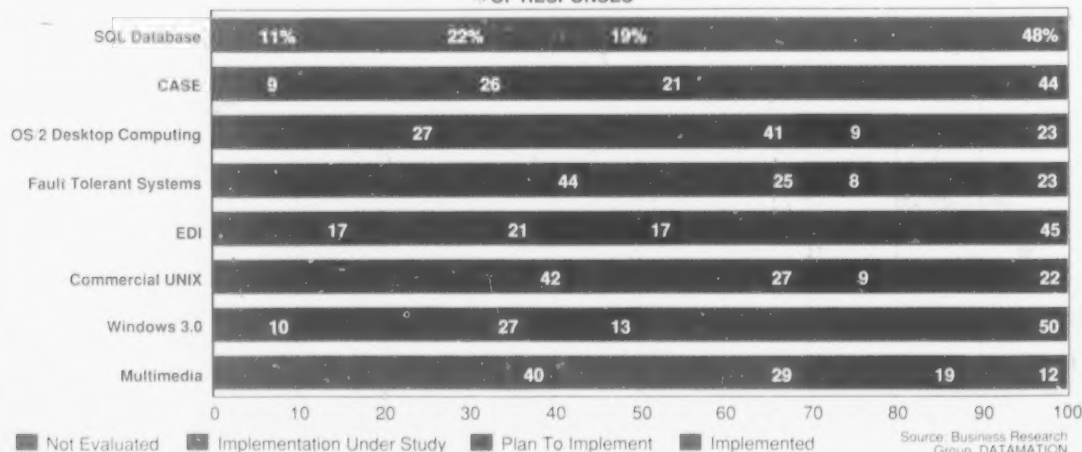
vide the contact between businesses and customers, pen-based systems could well end up playing a strategic business and marketing role for most corporations. But vendors will first have to ship products and show some performance capabilities.

For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-588-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

DATAMATION's Technology Implementation Index: Systems And Software

DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

% OF RESPONSES



DATA M A T I O N I N T E R N A T I O N A L

USER GROUP

DIRECTORY

Clout! DATAMATION's fifth annual International User Group Directory has plenty of it. Inside the 1992 directory are more than 200 user group entries, representing the vast bulk of organized purchasing power in the information technology industry today.

Once again this year, the User Group Directory has grown in size. The directory now boasts over 200 groups, up from last year's 180 and more than four times the entries of the first, 1988, edition. User groups from around the United States and the rest of the world, some of which had been unknown to us, have come forward and identified themselves for inclusion. And we are overjoyed to accommodate them.

The satisfaction comes from fulfilling the directory's purpose. That purpose is singular in nature and elegant in its simplicity: to encourage the dissemination of information and experiences about technology products and services in order to foster more informed purchasing and better utilization.

No matter what product you are using or thinking about using, you can turn to the directory for help in locating peers to obtain and share information. Included in the directory are the names and telephone numbers of many who head individual user groups; in other instances, those who serve a coordinating role for their groups are listed. We urge you to make good use of the directory.

If you are part of or represent a group not listed in the 1992 Directory and are interested in having information about your group published, please contact DATAMATION today. Call Susan Mael at (617)-558-4438.

—Researched, compiled and edited by Susan Mael, Kelly Mount and Joseph Bowen.

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
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The Advisory Group

P.O. Box 2804, North Canton, OH 44720 (216) 497-5018

\$250	None/150	Diebold	Diebold ATMs	Charles Simpson, First Tennessee, Knoxville, Tenn.	September 13-16, Long Beach, Calif.	Annual conference, newsletter, regional meetings, hotline, discounts	Carol Maness, (804) 847-9177
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Alpha Micro Users Society (AMUS)

735 Walnut Street, Boulder, CO 80302 (303) 449-6917

\$55-\$80	2,200/ N/A	Alpha Micro	Alpha Micro computer systems	James A. Jarboe III, Educational Video, Network, Huntsville, Ala.	March 9-13, Oakland, Calif.	Annual conference, monthly magazine, BBS, training seminars, hotline	Sharon Greene, (303) 449-6917
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Altai Software User Group

624 Six Flags Drive, Arlington, TX 76011 (817) 640-8911

None	*User base/ N/A	Altai Software	Altai IBM mainframe systems software	Phil Fisher, Manicare, Silver Spring, Md.	October 5-7, Fort Worth	Two meetings a year, quarterly newsletter, hotline support, regional training	Becky Grimes, (817) 640-8911
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Amdahl Users Group (AUG)

1250 E. Arques Avenue, Sunnyvale, CA 94088 (408) 746-8888

None	User base/ N/A	Amdahl	All Amdahl products	Jeffrey S. Dunn, Northwestern Mutual Life, Milwaukee	September 13-16 San Diego	Annual conference	AUG office, (408) 746-8888
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American Software Users Group (ASUG)

401 N. Michigan Avenue, Chicago, IL 60611 (312) 644-6610

\$250	N/A/ 320	American Software	All ASUG products	Poyas Haynes, Hisante Cooper, Monks Corners, S.C.	April 5-9, Atlanta, September 13-16, Marco Island, Fla.	Two annual conferences	Kimberly Svevo, (312) 644-6610
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The Americas' SAP Users Group

c/o Rich Guidotti, Dow Chemical, Jefferson Overpass Building, Midland, MI 48674 (517) 636-1151

\$200	100+	SAP AG	SAP Products	Rich Guidotti, Dow Chemical, Midland, MI	May/June Philadelphia, October/November location to be determined	Forums	Rich Guidotti, (517) 636-1151, Erika Bhatia (215) 595-4598
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Analyzer International Users Group Inc. (AIUGI)

c/o Decision Technology, 4390 U.S. Route 1, Princeton, NJ 08540 (619) 987-8950 or (800) 322-9370

None	N/A/ N/A	Decision Technology	The Decision Analyzer software	Elections upcoming	April 1992, Location to be announced	Annual conference, library of Analyzer routines, product poll	AIUGI coordinator, (619) 987-8950
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The Apple User Group Connection

20525 Mariani Avenue, M/S 36AA, Cupertino, CA 95014 (800) 538-9696, ext. 500

N/A	N/A/ N/A	Apple Computer	Macintosh and Apple II	N/A	N/A	Newsletters, quarterly video, system software updates, BBS, 1,000 groups	User Group Program office, (800) 538-9696, ext. 500
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Aries Technology User Group

600 Suffolk Street, Lowell, MA 01854 (800) 642-7437

\$35	N/A/ N/A	Aries Technology	Aries ConceptStation MCAE software series	Bud Burdick, Dresser Rand, Painted Post, N.Y.	May 3-6, Lowell, Mass.	One annual conference, quarterly newsletter	Drexel Ace, (508) 453-5310, ext. 248
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Artemis Users Association (AUA)

2900 N. Loop West, Houston, TX 77092 (713) 956-7511 or (800) 777-7100

None	1,800/ 300	Meter Management Systems	All Artemis products	John Weaver, Bonneville Power, Portland, Ore.	N/A	Annual conference, quarterly newsletter	AUA Office, (713) 956-7511
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ASKUS International, Inc.

401 N. Michigan Avenue, Chicago, IL 60611 (312) 527-6707

\$300 reg./ \$400 assoc.	N/A	Ask Computer Systems	MANMAN	Erwin Dolgin, Mowles Electric, Itasca, Ill.	To be determined	Annual conference	Barbara Chalick, (312) 527-6707
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1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
ASSIST (A Shared Solution in Software Technology) 401 N. Michigan Avenue, Chicago, IL 60611 (312) 644 6610							
\$250	N/A/ 570	Andersen Consulting	Andersen Consulting products	Victor Terranova, Geneva Genetics, Bloomfield, Colo.	May 3-6, New Orleans	Two annual conferences, quarterly publication	ASSIST headquarters, (312) 644 6610
Associacao Nacional dos Usuarios Unisys Rua Teixeira de Freitas 31, Sala 1104, 20021 Rio de Janeiro, RJ Brazil (21) 221 9480							
N/A	N/A/ 200	Unisys	Unisys mainframes	Roberto Macedo, Electronica Ltd.	N/A	Two meetings per year	(21) 221 9480
Association of Banyan Users International (ABUI) c/o Daniel & O'Keefe Assoc. Inc., Chiswick Park, 490 Boston Post Road, Sudbury, MA 01776 (508) 443 3330							
\$150	N/A/ 1,200	Banyan Systems	All Banyan products	Todd Sebastian, Metropolitan Life, New York City	April 12-15, Chicago (in conjunction with Canadian user association)	Two annual conferences, bimonthly magazine, BBS	Jean K. Williams, (508) 443 3330
ATLAS (AMS Tradeline Annual Seminar) 2 Rector Street, New York, NY 10006 (212) 618 0463							
None	50/ N/A	American Management Systems	AMS Tradeline banking software	Peter Wren, Bank of Montreal, Scarborough, Ontario	October 4-7, Colorado Springs	One international meeting per year	Patricia Grillos, (415) 508 5259
Australasian SHARE/GUIDE Ltd. P.O. Box 62, Turramurra, New South Wales, 2074 Australia (61) 2 449 6848							
\$A985	None/ 220	Independent	IBM System/370 and System/390 architectures including AS/400, MVS, VMS and VSE operating systems	Brian Hanlon, National Australia Bank, East Melbourne	February 23-26, Perth Aug. 30-Sept. 2, Sydney	Two regional meetings per year, research publications, supports associated groups	Ella Leightner, (61) 2 449 6848
Banking Automation Research Program V.le Eginardo 29, 20149 Milan, Italy							
\$1,600	15/ None	Data Management	Data Management Software	A. Petruzelis, Data Management, Milan	N/A	One or two conferences per year	N/A
BASE24 User Group 330 South 108th Avenue, Omaha, NE 68154 (402) 390 7606							
None	User base/ N/A	Applied Communi- cations	Entire EFT product line	Sharon Adelmann, Norwest Bank, Minneapolis	October 5-7, Boston	Annual conference, quarterly newsletter	Sharon Adelmann, (612) 667 0322
BiblioTech Users Group P.O. Box 277, Harvard, MA 01451 (508) 772 2001							
None	User base/ N/A	Comstow Information Services	BiblioTech Library Software Systems	None	June 3-5, San Francisco	Annual conference, quarterly bulletin, regional meetings	Lynda Moulton, (508) 772 2001
Big Apple Users Group (BAUG) P.O. Box 1822, Old Chelsea Station, New York, NY 10113 (212) 316 1830							
\$30	125/ N/A	Apple Computer	Apple Computer products	John McMullen, Jefferson Valley, N.Y.	Third Tuesday each month	Monthly meetings, SIG meetings, bimonthly newsletter, hotline, BBS	Donald Cohen, (212) 222 2277
BMC User Group P.O. Box 204, Sugar Land, TX 77487 (713) 240 8800							
\$125	150/ N/A	BMC Software	IBM mainframes	Glenn Ybarra, AT&T, Maitland, Fla.	April 1993 Houston	One conference every 18 months	Linda Koscinski, (713) 240 8800
Boole and Babbage User Group (BBUG) 510 Oakwood Parkway, Sunnyvale, CA 94086 (408) 735 9550							
None	User base/ N/A	Boole & Babbage	All Boole & Babbage products	Bert Cooley, New York State Electric & Gas Corp., Ithaca, N.Y.	May 17-20, Dallas	Annual conference	Carol Kaplan, (408) 735 9550

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1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Borland International Inc. 1800 Green Hills Road, Scotts Valley, CA 95066 (408) 439-1065							
N/A	Varies by grp	Borland International	Borland products	By group	By group	Information on product-specific regional groups	Tami Casey (408) 439-1065
Boston Computer Society (BCS) One Kendall Square, Cambridge, MA 02139 (617) 252-0600							
\$39	26,000/ N/A	Multiple	Multiple	Tracy Kicklader, president	Monthly	Monthly meetings, SIGs, newsletters, BBS, helplines	BCS office, (617) 252-0600
British Isles RAMIS Users Group (BYRUG) c/o General Accident Information Center, Fifeavills, Perth, PH20NH Scotland (0738) 21202 ext 5657							
N/A	N/A/ N/A	Computer Associates International	RAMIS Information System and RAMIS/PC Workstation	Ian McPherson, General Accident, Perth, Scotland	N/A	Two annual meetings	Ian McPherson, (0738) 21202, ext 5657
BT Users Group 2560 N. First Street, San Jose, CA 95161 (408) 922-7505							
\$175	Usr base/British N/A	Telecom	BT products	Norm Gifford, Mark Milano, George Grille, Tom Savoca	N/A	Annual conference, quarterly newsletter	Tony Agnelli (408) 922-7505
BUS 7, Rue Biscornet, 75014 Paris, France (33 1) 40-01-00-02							
FF250	N/A	Groupe Bull	GCOS 6, 7 and 8	J.J. Renault, RATP, Paris	September 30 October 2, Malaga, Spain	One annual meeting, bimonthly newsletter	F. Daigne, (33 1) 40-01-00-02
Bull Users Society (BUS) P.O. Box 2314, Cherry Hill, NJ 08034 (609) 231-1486							
\$225	None/ 600	Bull	All Bull products	Shirley Eick, Metropolitan Life, New York City	April 5-8, Louisville, Ky	Two annual conferences, semiannual newsletter	Lester Pacca, (609) 231-1486
Business Application Conference 711 Stewart Avenue, Garden City, NY 11530							
None	Usr base/Computer N/A	Associates International	Financial, accounting, distribution and decision support software	N/A	N/A	Annual conference	Alita Montes, (516) 227-3300
CA Masterpiece Users Group P.O. Box 637, Indian Rocks Beach, FL 34635-0637 (813) 596-1914							
None	3,000/ N/A	Computer Associates International	CA Masterpiece	Hollis Ezell, Avondale Mills, Sylacauga, Ala	April 26-29, Los Angeles	Annual conference, newsletter, product advisory committees, reviews	Hollis Ezell, (205) 249-1508
CDRS User Group 6111 North River Road, Rosemont, IL 60018 (708) 698-3000							
None	None/ 1,800	Comdisco Disaster Recovery Services	All Comdisco services	N/A	March 4-6, Dallas	Annual conference, quarterly newsletter	Carol Madaras, (708) 698-3000
CHAMPS User Group Meudon Avenue, Farnborough, Hampshire, GU14 7NB U.K. (44) 252 544 321							
None	Usr base/Thorn EMI N/A	CHAMPS Hotel System		Philip Scottcombes, Bonnington Hotels, London	N/A	Quarterly meetings	Douglas Ros, (44) 252 544-321
ClaimFacts Inc. 1700 Broadway, New York, NY 10019 (212) 765-8500							
\$200	None/ 70	Enisco Inc	ClaimFacts, CertFacts	Duncan MacDonald, NRECA/CBA, Washington, D.C.	May 27-28, San Diego	Annual conference	Cindy Morton, (212) 765-8500
Club des Utilisateurs Bull Europeens (CUBE) 43, Rue de la Chaussée d'Antin 75009 Paris, France (33) 1-48-74-9417							
FF1,700 5,000	N/A/ 1,000 groups	Bull	GCOS 8, CGOS 7, CGOS 6, CGOS 4, UNIX, CTOS, MS/DOS, Multics, DPS 9000, DPS 8000, DPS 8, DPS 7000, DPS 6, DPS 4, DPX, Questar	Jean Pierre Muller, Gieouest, Nantes, France	N/A	Annual conference, regional meetings, SIGs	CUBE office, (33) 1-48-74-9417

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Cognos International Users' Group 3755 Riverside Drive, Ottawa, Ontario K1G 3Z4 Canada (613) 738-1440							
None	N/A/ N/A	Cognos	All Cognos products	None	October 19-22 Dallas	International conference, regional meetings, quarterly newsletter	Anne Betz, (613) 738-1440, Ext. 3553
College and University Systems Users Group (CUFFS) 1777 North Kent Street, Arlington, VA 22209 (703) 841-6391							
None	None/ 80 +	American Management Systems	AMS college and university financial products	John Johnston, Algonquin College Toronto, Ontario	April 26-29, Reston, Va.	Annual conference, quarterly newsletter	Dorothy Cotman, (703) 841-6391
Commodore 1200 Wilson Drive, West Chester, PA 19380 (800) 448-9987							
N/A	N/A/ N/A	Commodore Business Machines	All products	None	N/A	Information on 350 regional groups	Customer service, (800) 448-9987
COMMON 401 N. Michigan Avenue, Chicago, IL 60611 (312) 644-6610							
\$250	N/A/ 4,500	IBM	All IBM midrange hardware	Gene Gailman, CYRO Industries, Mount Arlington, N.J.	April 28-30, Atlanta, October 19-23, Anaheim, Calif.	Two annual conferences, quarterly newsletter, other publications	COMMON headquarters, (312) 644-6610
Communications Resource Management System User Group 300 S. Wacker Drive, Chicago, IL 60606 (800) 448-8777							
N/A	N/A/ N/A	Chi/Cor Information Management	CRMS Software	Carolyn Deters, IDS Financial Services Inc.	September 14-16, Chicago	Annual Conference	Hend Ewell, (800) 448-8777 or (312) 322-0150
Computer Associates Visual Information Association 711 Stewart Avenue, Garden City, NY 11530							
N/A	User base/ N/A	Computer Associates International	CA graphics products	Ron Blue, State Farm, Bloomington, Ill.	N/A	Annual conference, quarterly newsletter, nine regional groups	Alita Montes, (516) 227-3300
Compuware Corp. 6849 78th Avenue, Minneapolis, MN 55445 (612) 560-8633							
None	N/A/ N/A	Compuware	Interactive testing and analysis tools	N/A	N/A	Provides information on regional groups	Audrey Williams, (612) 560-8633
Comshare Users Group 3001 South State Street, Ann Arbor, MI 48108 (313) 994-4800							
None	User base/ N/A	Comshare	Comshare products	Roy Taylor, Whirlpool Corp., Benton Harbor, Mich.	N/A	Annual conference, local groups, newsletter, database	Julie Tite, (313) 994-4800
Comten Users' Exchange (CUE) c/o Ron Block, Donovan Data Systems, 115 West 18th Street, New York, NY 10011 (212) 633-5080							
None	N/A/ N/A	NCR Comten	Comten front-end processors	Ron Block, Donovan Data Systems, N.Y.C.	April 1992, Location to be determined	Two annual conferences	Ron Block, (212) 633-5080
CONTROL:User Group (CUG) P.O. Box 302, Troy, MI 48007 (313) 641-4644							
N/A	N/A/ N/A	Cincom Systems	CONTROL: Manufacturing software for IBM and Digital Equipment	John Forrest, Vickers Inc., Troy, Mich.	June 7-11, Cincinnati	Annual conference, newsletter, 5 SIGs	John Forrest, (313) 641-4644
Convex User Group 3000 Waterview Parkway, Richardson, TX 75080 (214) 497-4000							
None	User base/ N/A	Convex Computer	Convex supercomputer	Michael Padrick, President	May 17-22, Location not yet announced	Annual worldwide user conference, software library, newsletter	Mary Kay Havens, (214) 497-4000

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1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems Products	Top Officer	Next Meeting	Services Provided	Contact
Cooperative Users of Recognition Equipment (CURE) 2701 East Grauwiler Road, Irving, TX 75061 (214) 579-6000							
None	None/ 5,620	Recognition Equipment	All REI data capture systems	None	N/A	Annual conference	Paula Ezernak, (214) 579-6000
Corporate Association for Microcomputer Professionals (CAMP) 950 Skokie Boulevard, Suite 310, Northbrook, IL 60062 (708) 291-1360							
\$95 for 2 people	N/A/ N/A	No affiliation	All microcomputer hardware, software and services, office productivity, networking and application development	Julian Horwich	Meets twice monthly	Meetings, bulletin board, seminars, tradeshows	Julian Horwich, (708) 291-1360
Cortex Users' Society (CORUS) P.O. Box 241, Waltham, MA 02254 (617) 622-1900 ext. 718							
None	User base/ N/A	Cortex Software	CorVision Software	Margaret Gilbert, DuPont IEA, Wilmington, Del.	October 1992, Location to be decided	Annual conference, quarterly newsletter	Ken MacLaurin, (617) 622-1900 ext. 718
Cray User Group Inc. c/o Gunter Georg, Grumman Corp., DO9-GHQ, Bethpage, NY 11714 (516) 575-2855							
\$200	None/ 200	Cray Research	All Cray products and interfaces to other equipment	Mary Zoser, Lawrence Livermore Labs, Livermore, Calif.	April 6-10, Berlin; September 13-18, Washington, D.C.	Two annual conferences newsletters	Gunter Georg, (516) 575-2855
Credit Management Systems 1777 N. Kent Street, Arlington, VA 22209 (703) 841-6404							
None	User base/ N/A	American Management Systems	AMS credit management systems software	Barb Goudin, Bank of Nova Scotia, Toronto	October 4-7, Colorado Springs	One user conference every 18 months newsletter	Pat Grillos, (415) 508-5259
CTOS Users Forum (CTUF) 2700 N. First Street, San Jose, CA 95134 (408) 434-2653							
\$95	N/A/ 250	Unsys. Convergent Technologies	CTOS operating system and compatible products	Daniel Leary, Automated Programming Technologies, Birmingham, Mich.	N/A	Annual conference, newsletter	Will Linkmin, (216) 871-3135
CUBE Inc. 100 Maple Park Boulevard, Suite 152, St. Clare Shores, MI 48081 (313) 771-9300							
None	4,000/ None	Unsys.	All Unsys. products	Tom Hind, Spartan Mills, Spartan Brook, S.C.	April 27-30, San Francisco; October 12-15, Atlanta	Two annual conferences newsletter	Mary Lou Regan, (313) 771-9300
CUE North America P.O. Box 1551, New London, CT 06320 (203) 443-2883							
\$100- 400	None/ 300	Cadac	All Cadac software	Rosemary Russo, McDonald's Corp., Oak Brook, Ill.	March 16-19, Denver	Two annual conferences, newsletter, BBS	Catherine Foley, (203) 443-2883
Cyborg Users Association 1163 Sherman Road, Northbrook, IL 60062 (708) 205-1330							
\$100	N/A/ N/A	Cyborg Systems	All Cyborg Software	Richard C. Dole, State Mutual Life, Worcester, Mass.	April 21-24, Chicago	Conferences, newsletter, resource manual	Ralph Wells, (708) 205-1330
Data Administration Management Association International 152 W. Northwest Highway, Suite 103, Palatine, IL 60067							
None	N/A/ N/A	No affiliation	N/A	Pat Cipoli, Unocal Corp., Schaumburg, Ill.	To be determined	Newsletter for local chapters, co-sponsor annual symposium with a local chapter	Susan Farenci, (212) 898-1590
Datamcom/Ideal Midwest Regional Users Group c/o Marty Marsh, Zurich American Insurance, 1400 American Lane, Schaumburg, IL 60196 (708) 605-6027							
None	N/A/ 75	Computer Associates International	CA-Datamcom and CA-Ideal	Marty Marsh, Zurich American Insurance, Schaumburg, Ill.		Quarterly meetings, workshops, software exchange	Marty Marsh, (708) 605-6027

1992 INTERNATIONAL USER GROUP DIRECTORY

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Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
Delaware Valley DB2-SQL/DS Users' Group P.O. Box 7777, W2470, Philadelphia, PA 19175 (215) 522-6294							
\$35 (one time fee)	1000/ N/A	IBM	DB2, SQL/DS	Mike Fitzgerald Coopers & Lybrand	January 29, April 22 July 15, October 21 All around Essington, Pa.	Quarterly meetings	Jean A. Tucker (215) 522-6294
Digital Equipment Computer Users Society (DECUS) 333 South Street, SHR 1, 41032, Shrewsbury, MA 01545 (508) 841-3389							
None	50,000/ N/A	Digital Equipment	DEC products	Bill Brindley, HDQ Naval Security Group Command Washington, D.C.	May 2-8, Atlanta December 5-11, Las Vegas	National symposia, regional conferences, newsletter, software library	Trecha Power (508) 841-3389
DMS/OS User Group 11050 White Rock Road, Rancho Cordova, CA 95670 (916) 636-1304							
None	N/A/ User base	Sterling Software	Storage management and data communications products	None	April 12-15, Chicago	Annual conference, newsletter	Kim Hughes (916) 635-5535
DocuGroup 5910 North Central Expressway, Suite 800, Dallas, TX 75206 (214) 891-6500							
None	User base/Image N/A	Sciences	All Image Sciences products	None	May 2-7, Dallas	Annual conference	Munel Hogan (214) 891-6500
Dun & Bradstreet Software Users Group 1445 Peachtree Road Northeast, Atlanta, GA 30326 (404) 239-2506							
None	N/A/ 7,500	Dun & Bradstreet Software	E Series software	E. D. Simmons, Enron Corp., Les Palmer Hallmark Cards Inc.	April 21-25, Atlanta	One international conference; regional/industry specific meetings, newsletter	Kerry Coxworth (404) 239-2506
Dun & Bradstreet Software Users Group U.K. P.O. Box 273, Kings House, Bona Street, Bristol BS59 7AA, U.K. (44) 272 27 6866							
None	All U.K./ Users	Dun & Bradstreet U.K.	Financial and tools software	N/A	September 14-18, Brighton, U.K.	One conference a year, quarterly magazine	Jane Gould (44) 272 27 6866
Dylogue 9340 Cinnamon Avenue, P.O. Box 2210, Chatsworth, CA 91313 (818) 718-8677							
None	User base/Sterling N/A	Software Dylakor Division	All Dylogor products	None	April 12-15, Chicago	One annual U.S. meeting, international and regional seminars, newsletter	Kim Hughes (916) 635-5535
EDGE International P.O. Box 691, Cordoba, WI 53110 (414) 963-7131							
\$300	None/ 250	Multiple	Xerox and Xerox compatible systems	Tim Martin, Boeing Support Services, Seattle	May, 1992 Location to be determined	Two annual conferences, newsletter	EDGE Headquarters (414) 963-7131
EDV-Anwenderkreis e.V. (EAK) P.O. Box 81 690, Wankersheim, Germany (49) 7934-3036							
DM180/ DM327	323	Siemens Nixdorf	Nixdorf systems 8810, 8840, 8860, 8870 Quattri, and 8890, standard software Nixdorf COMET TOP, 8818	Rudiger Brand Government Services Melbourne, Fla.	November 15, Location not yet announced	Hardware/software support, seminars, congresses, education	(49) 7934-3036
Encore Users Group 6901 West Sunrise Boulevard, Ft. Lauderdale, FL 33310 (305) 797-5423							
None	3,000/ N/A	Encore	All Encore products	Ron Kirkpatrick, GE Government Services Melbourne, Fla.	May 18-22, Ft. Lauderdale, Fla.	Two annual conferences, software library	Lynne Connors (305) 797-5736
Encore Users Group International 6901 West Sunrise Boulevard, Ft. Lauderdale, FL 33310 (305) 797-5423							
None	3,000/ N/A	Encore	All Encore products	Ray Crawford, Royal Aerospace Establishment, Pyestock, England	May 18-22, Ft. Lauderdale, Fla.	Two annual conferences, library	Lynne Connors (305) 797-5736

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
E							
F							
European Control Data Users							
Barer Strasse 21, D 8000 Munich 2, Germany (49) 89 2105 7408							
SFr200	N/A/ 151	Control Data	Large mainframes for scientific, technical and database applications; sophisticated operating systems and networks; high performance workstations	Dietz Schubring, Leinz Rechenzentrum, Munich	N/A	Two national meetings per year, bimonthly newsletter	Eric Luitj, (31) 70 264 221, ext 588
EurOpen (European Forum for Open Systems)							
Owles Hall, Buntingford, Herts, SG9 9PL, England (44) 763 73039							
By local group	6,000/ N/A/	AT&T UNIX Europe		Michel Gen, Chorus Systemes, Paris	N/A	Two annual international conferences, newsletter, European UNIX Groups	Mrs. H. Gibbons, (44) 763 73039
Express User Group U.S.							
200 Fifth Avenue, Waltham, MA 02154 (617) 890 1100							
\$495/ \$500	N/A	Information Resources	Information Resources; Decision Support Software	Steve Rubinow, Budget Rent A Car, Chicago, Ill.	September 25-28	Annual Conference, newsletter	Paul Murray, (617) 890 1100
FACOM Family Kai							
6-1 Marunouchi 1-chome, Tokyo 100, Japan (81) 3 216 3211							
24,000 yen	None/ 3,950	Fujitsu	All Fujitsu computers, FACOM computers	Hideo Watanabe, Mitsubishi Kasei Corp.	N/A	One national meeting per year, newsletters and other publications	(81) 3 216 3211
Federation of NCR User Groups (FNUG)							
5008 08 Pine Creek Drive, Westerville OH 43081 (614) 895 1280							
\$100	NA/ 4,000	NCR	All NCR products	Robert E. Richter, Baker Manufacturing, Evansville, Wis.	April 26-29, Atlanta	One user conference and one technical seminar, quarterly newsletter	FNUG office, (614) 895 1280
Fieldwatch Users' Group (FUG)							
c/o AT&T Paradyne, P.O. Box 2826, 8545 126th Avenue N., Largo, FL 34649 (813) 530 2956							
None	350/ 115	The Data Group	Fieldwatch software for IBM, VAX and HP mainframes	Allison Buckner, AT&T Paradyne, Largo, Fla.	May 1992, Orlando, Fla.	Two annual conferences, newsletter, software library	Allison Buckner, (813) 530 2956
FMS/IDEAS Users Group							
550 North Reed Street, Suite 203, Tampa, FL 33609 (813) 282 0330							
None	N/A/ N/A	Cogent Information Systems	Price Waterhouse systems, financial management systems, IDEAS, FMS/Link, IDEAS/Link	Guy Michael, Exxon Yemen Corp., Houston	October 20-23, Tarpon Springs, Fla.	One annual conference, user group board newsletter	June Tung, (201) 379 7979
Fox Valley Technical College PC User Group							
P.O. Box 2277, Mail Room 318, Appleton, WI 54913 (414) 735 2470							
\$15	245/ N/A	Multiple	PCs and compatibles	Jim Jensen, WEM FM, Menasha, Wis.	Monthly meetings	Monthly meetings, newsletter	Judith Brown or Cindy Kane, (414) 735 2470
Fujitsu Large Systems Users Group							
17-25 Shin Kamata 1-chome, Ota-ku, Tokyo 144, Japan (81) 3 735 1111							
None/ 30,000 yen	None/ 304	Fujitsu	Fujitsu systems larger than M 760/R	Kazumi Yasuda, Fuj Electric Co. Ltd.	June 11-12, Location to be determined	One national meeting per year, quarterly newsletter	Kami Kobayashi, (81) 3 735 1111
Fujitsu Scientific Systems Users Association							
17-25 Shin Kamata 1-chome, Ota-ku, Tokyo 144, Japan (81) 3 735 1111							
20,000 yen	2/ 57	Fujitsu	FACOM mainframes in scientific and technical fields	Makoto Nagao, Kyoto University	N/A	Meetings, newsletters	(81) 3 735 1111
Fuse Inc. (Focus Users Group)							
200 Craig Road, Suite G, Freehold, NJ 07728 (908) 308 9275							
None	8,000/ N/A	Information Builders	Focus	Steve Hodas, Sealand, Seattle	April 30-May 5, Dallas	Annual conference, quarterly newsletter	Rosemary Mauro, (908) 308 9275

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems Products	Top Officer	Next Meeting	Services Provided	Contact
Genesis							
Network Systems Switzerland, Hohlstrasse 536, 8048 Zurich, Switzerland (41) 1 431 5340							
None	N/A/50	Network Systems	Network Systems Corp. products	Olivier Calet Electronique Serge Dassault, St. Cloud France	May 12-15 Copenhagen Denmark	Annual conference, conference proceedings	Annamarie Tollado, (41) 1 431 5340
Global Software User Group Inc.							
P.O. Box 51420, Raleigh, NC 27615 (800) 326 3444							
None	N/A/2,000	Global Software	Global's financial software	Vicki Walkup, Mead Corp. Dayton, Ohio	August 25-28 Orlando, Fla.	Annual conference, quarterly newsletter	John Ais, (800) 326 3444
Government Management Information Services (GMIS)							
P.O. Box 926, Wichita Falls, TX 76307 (817) 692 3707							
\$50 \$200	N/A/ 200	Multiple	Data processing in government agencies	Robert Carney, Black Hawk City, Iowa	June 21-25 Dallas	Annual conference, newsletter, annual survey	Dick Schmid, (214) 653 6141
Government Systems Users Group (GSUG)							
1777 North Kent Street, Arlington, VA 22209 (703) 841 6000							
None	U.S. based/American N/A	Management Systems	Government systems products	Steven Brown, State of Alabama, Montgomery, Ala.	September 1992 Crystal City, Va.	Annual conference, quarterly newsletter, regional meetings	Dorothy Cotman, (703) 841 6391
GroupFacts Advisory Board							
170 Broadway, New York, NY 10019 (212) 765 8500							
\$300	N/A/ 25+	Enrico	GroupFacts	Joseph Fields, Rural Security Life Insurance Co., Madison, Wis.	February 14, Miami May 27-28, San Diego	Annual conference	Cindy Morton, (212) 765 8500
GrowthPower User Group							
70 Blanchard Road, Burlington, MA 01803 (617) 229 2200							
None	None/ 750	Powersoft	GrowthPower software and HP hardware	None	N/A	One annual meeting, quarterly newsletter, umbrella for 20 local groups	Kathi Gungley, (617) 229 2200
GUIDE							
c/o Erwin Frankovic, Schweizerische Eidgenossenschaft, Gewerbestrasse 11, 8002 Zurich (41) 1 268 3545							
N/A	N/A/ N/A	IBM	All IBM System/370 architecture and top end AS/400 products	N/A	N/A	Two international conferences per year, newsletters	(41) 1 268 3545
GUIDE International Corp.							
401 N. Michigan Avenue, Chicago, IL 60611 (312) 644 6610							
\$450	N/A/ 2,500	IBM	3090, 3090, 4300, 9370, ES/9000, AS/400	Ben Parker, Deere & Co., Moline, Ill.	March 15-20, Los Angeles, July 12-17, Chicago, November 15-20, Atlanta	Three annual conferences, symposia, newsletters	Gina Speziale, (312) 644 6610
HITAC Users' Association							
Hitachi Union Annex #2, 27-18, Moriguchi, 6-chome, Shinagawa-ku, Tokyo 140, Japan (81) 3 763 2411 Ext. 3201, 3205							
24,000 yen	N/A/ 1,780	Hitachi	All Hitachi computer systems	Kenzo Sakai, Shoko Chukan Bank	N/A	One annual national meeting, magazine and research papers	Kazuyuki Hanazuka, (81) 3 763 2411
Hogan User Group International Inc. (HUG)							
Benderson Office Park, 5008 11 Pine Creek Drive, Westerville, OH 43081 (614) 895 1362							
\$400	N/A/ 108	Hogan Systems	Hogan Systems software and IBM financial application software	Fred Finlay, Irish Permanent Building Society, Dublin	May 4-7 Lake Buena Vista, Fla.	Annual conference, quarterly journal	Jim Bannister, (614) 895 1362
ICL Computer Users Association							
P.O. Box 42 Bracknell, Berkshire RG12 2JQ, U.K. (44) 3 44 482933							
\$50 \$200	N/A/ 40 groups	ICL	All ICL products	David Stewart, Magistrate's Court, Manchester, England	N/A	Annual conference, regional meetings, quarterly journal	Association secretary, (44) 3 44 482933

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
ImpleFacts Advisory Board							
1700 Broadway, New York, NY 10019 (212) 765-8500							
None	N/A/ User base	Enisco	ImpleFacts	John McLaughlin, Goodwin Inc., Branckoff Manor, N.Y.	May 27-28, San Diego	Annual conference	Cindy Morton, (212) 765-8500
Info Exchange							
711 Stewart Avenue, Garden City, NY 11530							
None	N/A/ N/A	Computer Associates International	CA's Infopoint products	Mike Ritchie, UBJ Financial Corp., Princeton, N.J.	N/A	Annual conference, quarterly newsletter	Alita Montes, (516) 227-3300
Information Dimension Exchange Association (IDEA)							
655 Metro Place South, Dublin, OH 43017 (614) 761-8083							
\$30	570/ None	Information Dimensions	All Information Dimension products	Debbie MacDonald, MacDonald Consulting, Washington, D.C.	N/A	Two annual conferences	Sandra Sabanski, (913) 381-4458
Information Systems Security Association Inc. (ISSA)							
P.O. Box 9457, Newport Beach, CA 92658 (714) 250-4772							
\$70	2,100/ N/A	Multiple	Security products	Sally Meglathery, New York Stock Exchange, N.Y.C.	March 21-27, Houston	Annual conference, 35 regional chapters, quarterly magazine	Richard V. Ruft, (214) 250-4772
Information User Association (IUA)							
401 N. Michigan Avenue, Chicago, IL 60611 (312) 644-6610							
None	N/A/ 1,850	Computer Associates International	CA iDMS/DB, CA DB VAX, VAX UNIX, CA Datacom/DB, CADRE and related applications	George Emmanuel, Hughes Aircraft, Long Beach, Calif.	April 5-9, Dallas	Annual conference, user contributed libraries	Ann van Meulen, (312) 644-6610
IntelliCorp Users Group (ICUG)							
1975 El Camino Real West, Mountain View, CA 94040 (415) 965-5500							
None	User base/IntelliCorp N/A		All IntelliCorp software products	None	Not available	Annual conference, regional meetings	Debbie Kern, (415) 965-5500
Interchange Inc.							
One Technology Way, Westford, MA 01886 (508) 392-2651							
\$50 Indiv./ \$150 Corp.	1,600/ 4	Concurrent Computer	Concurrent's real time systems	Ellen MacDonald, John Bars, Jim Schultz, Prentice Mooney	September 25, Las Vegas	Annual conference, quarterly newsletter, three software libraries, BBS	Ellen MacDonald, (508) 392-2651
Interex Inc. (The International Association of HP Computer Users)							
P.O. Box 3439, 585 Maude Court, Sunnyvale, CA 94088 (408) 738-4848							
\$80 Indiv./ \$400 Corp.	N/A/ N/A	Hewlett/ Packard	All HP computer products	Chuck Percy, CEO, Interex	August 24-27, New Orleans	Conferences, two monthly magazines, newsletters, BBS	Ruby Turner, (408) 738-4848
International CSP User Group (CSPUG)							
204 Andover Street, Andover, MA 01810 (508) 470-8880							
\$50	125/ N/A	Multiple	IBM's CSP K. CCS's CSP/ADE	Michael J. Cocca, K-G Computer Services, Dallas	June 29-July 1, Boston December 8-10, Chicago	Quarterly newsletter conferences, local user group sponsorship	Michael J. Cocca, (214) 830-6800
International Databus Users Group (IDUG)							
13603 Jester Road, Suite 404, Dallas, TX 75238 (214) 871-3102 or (214) 340-6834 (BBS)							
None	250/ N/A	Multiple	Databus programming language	Mike Shaffer, Savant Technologies, Dallas	September 1992, Location to be decided	Annual conference, newsletter, BBS	Mike Shaffer, (214) 871-3102
International Data 3 Users Group (IDIG)							
1375 Corporate Center Parkway, Santa Rosa, CA 95407 (707) 528-6560							
None	User base/ASK Computer N/A	Systems, Data 3 Division	Data 3 software running on the AS/400	Kevin Woolf, Engelhard Corp., Iselin, N.J.	September 15-18, St. Louis	Annual conference	Richard Hardcastle, (707) 528-6560
International DB2 Users Group (IDUG)							
401 N. Michigan Avenue, Chicago, IL 60611 (312) 644-6610							
None	1,500/ None	IBM	DB2	Ken Parms, Forecross Corp., San Francisco	May 10-14, New York	Annual conference, BBS, bimonthly newsletter	Laura Navaroli or Bill Crowley, (312) 644-6610

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
International Function Point Users Group (IFPUG) 5008 28 Pine Creek Drive, Westerville, OH 43081 (614) 895 7130							
\$200	285	Multiple	Metrics and function point measurement	Craig Scates, GTE Data Services, Temple Terrace, Fla	April 13-16, Charleston, S.C.	Two annual conferences, newsletter, manuals	Nancy P. Marshall, (614) 895 7130
International Intergraph Graphics Users Group (IIGUG) Huntsville, AL 35894 0019 (205) 730 2292 or (800) 642 9420							
None	User base/Intergraph N/A	All Intergraph hardware and software	Ray McEvoy, Perkins Gilmer, Buckinghamshire, England	Int'l May 4-8, Huntsville, Ala. U.S. September 27-October 1, Anaheim, Calif.	International conference, U.S. conference, newsletters, 14 SIGs	Guy Nesin, (205) 730 2292	
The International Mini/Microcomputer Information Exchange (TIMIX) P.O. Box 201897, Austin, TX 78720 (512) 250 7151							
\$85	4,500/ N/A	Texas Instruments	All Texas Instruments computer products	John Martin, Houston Computer Services, Inc., Houston	June 27-30, Orlando, Fla.	One national meeting, monthly magazine, direct mail service	Rosemary Colgrove, (512) 250 7151
International Model 204 Users Group P.O. Box 966, Cambridge, MA 02142 (617) 661 6204							
\$25	1,600/ N/A	Computer Corp. of America	Model 204 RDBMS	Eric Adler, A.C. Nielsen Company, Dunedin, Fla.	Not available	Annual conference, newsletter, regional group meetings, SIGs	Headquarters, (617) 661 6204
International Office Technologies Association (IOTA) 248 Columbia Turnpike, Florham Park, NJ 07932 (201) 292 3427							
\$5,500 corp. \$2,000	None/ 70 max	Multiple	Office technologies	Michael J. Chumer, executive director	Not available	Two annual conferences, research reports, peer review	Michael J. Chumer, (201) 292 3427
International Oracle User Group 500 Oracle Parkway, Redwood Shores, CA 94065 (415) 506 7000							
By chapter	By grp	Oracle	All Oracle products	Michael Corey, President	By regional or local group	Umbrella organization for 80 groups	Katy Walneuski, (415) 506 5328
International Society of Wang Users (ISWU) 2138 South 61st Court, Suite 205, Chicago, IL 60637 (708) 652 15WU							
None	N/A	Wang Laboratories	All Wang products	Matt Gilman, Blue Cross/Blue Shield, Chicago	N/A	Information on 12 groups	ISWU office, (708) 652 15WU
International Software AG Users Group (SAGGROUP) 11190 Sunrise Valley Drive, Reston, VA 22091 (703) 391 6727							
None	User base/ Software AG N/A	All Software AG products	Jim Hill, Washington State University, Pullman, Wash.	May 11-15, New Orleans	Annual conference, newsletter	Jen Norman, (703) 391 6727	
International Tandem Users Group (ITUG) 401 N. Michigan Avenue, Chicago, IL 60611 (312) 644 6610							
\$375	2,600/ 900	Tandem Computers	All Tandem Products	Ned Clark, Gallagher, Bassett Services	April 12-16, Nice, France	Conferences, journal, library, consultant-vendor directory, tutorials	Allison Powers, (312) 644 6610
International Users Group for Repository and AD/Cycle 401 North Michigan Avenue, Chicago, IL 60611 (312) 644 6610							
None	300/ N/A	IBM	IBM Repository and AD/Cycle	Howard Fosdick, Fosdick Consulting, Villa Park, Ill.	N/A	Annual conference	Marlene Griffin, (312) 644 6610
Intersolv User Group Inc. P.O. 934, Kendall Square, Cambridge, MA 02142 (617) 494 8200							
\$95	N/A/ 555	Intersolv Inc.	Excelerator, Excelerator/RTS, XL/DI, PC Prism, PVCS, APS	Dan Weir, Los Alamos National Labs, Los Alamos, N.M.	Fall 1992, Location to be determined	Annual conference, newsletter, software library, discount publications	Pamela Meyer, (617) 494 8200

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The IV League Inc.							
5900 Canoga Avenue, Woodland Hills, CA 91367 (818) 716-1616							
\$350	450	Sterling Software, Answer Systems Div.	Answer products, MARK products, ZIM, Sterling TestPro, Sterling Developer	Harry Kebabjan, Sterling Software	April 12-15, Chicago	System evaluation committee, user conference	Marcia Steinhorn, (818) 716-1616
Japan Unisys Users Association							
Nihon Unisys Ltd., 17-51, Akasaka 2-chome, Minato-ku, Tokyo 107, Japan (81) 35-485-4400							
24,000 yen	1,300	Nihon Unisys	Unisys Series 2200/1100, A/V series mainframe	Senya Adachi, President	May 21-22, Tokyo	Two conferences per year, monthly publications, technical reports	Muneo Murakami, (81) 35-485-4400
J.D. Edwards User and Business Partner Conference							
8055 E. Tufts Avenue, Suite 1300, Denver, CO 80237 (303) 488-4000							
N/A	Usr base	J.D. Edwards & Co	J.D. Edwards products	N/A	June 8-12, Denver	Annual conference, newsletters	Manissa Gotta, (303) 488-4000
KnowledgeWare User Conference							
3340 Peachtree Road NE, Atlanta, GA 30326 (404) 231-8575							
N/A	Usr base	KnowledgeWare	All KnowledgeWare products	N/A	March 2-4, Atlanta	Annual Conference	Diana Felde, (404) 231-8575
Lawson User Exchange							
1300 Godward Street, Minneapolis, MN 55413 (612) 379-2633							
None	Usr base	Lawson Associates	Financial, human resources, distribution and retail application software	Ken Hotec, President & CEO	August 10-13, Minneapolis	Technical, end-user and management sessions, labs	Monica Nanstad, (612) 379-2633
Lotus User Group Program							
55 Cambridge Parkway, Cambridge, MA 02142 (617) 693-1606							
N/A	N/A / N/A	Lotus Development	All Lotus products	N/A	N/A	Provides information on regional user groups	Elena Fernandez, (617) 693-1606
MacIS							
401 N. Michigan Avenue, Chicago, IL 60611 (312) 644-6610							
\$500 indiv / \$1,500 Corp	67 / 111	Apple Computer	Apple computers in information systems	Jim Young, EDS Dallas	March 1992, Toronto	Two annual conferences, surveys, BBS, newsletter	Pam Swenson, (312) 644-6610
Magec User Group (MUG) 4054 Infomart, 1950 Stemmons Freeway, Dallas, TX 75207 (214) 746-4000							
N/A	N/A	Magec Software	Magec rapid application development system	Marci Gard, Central & South West Services, Dallas	N/A	N/A	Marci Gard, (214) 754-1574 Lisa Payne, (214) 954-7250
MaGen User Group							
Haverly Systems, 12 Hinchman Avenue, P.O. Box 919, Denville, NJ 07834 (201) 627-1424							
None	N/A / 400	Haverly Systems	Haverly Systems linear programming modeling software	Ken Spencer, Haverly Systems	July 1992, Location to be determined	One U.S. meeting, one European meeting, one Asian meeting	Ken Spencer, (201) 627-1424
MAI National Users Group (MAIFUG)							
P.O. Box 124, Union City, CA 30291 (800) 241-7345							
By local group	1,200+ / None	MAI Systems	All MAI products	George Miller, Cleveland Group, Atlanta	August 22-26, Chicago	Annual conference, newsletters, educational services, 24 local groups	Phil Basler, (714) 731-5100
Maximo User Group (MUG)							
20 University Road, Cambridge, MA 02138 (617) 661-1444							
None	Usr base / PSDI N/A	Maximo	Maximo maintenance system	N/A	Fall 1992, Location to be announced	Annual conference, newsletter, BBS	Rob Bloom, (617) 661-1444
MicroMan II User Group							
c/o POC-IT Management Services Inc., 429 Santa Monica Blvd., #460, Santa Monica, CA 90401 (310) 393-4552							
None	835 / 475	POC-IT Management Services	MicroMan II: System Development Guide, MicroMan Esti-Mate	Michael Ranger, AT&T Paradyne	March 1992, Santa Monica	Annual meeting, newsletter, surveys	Sally Jacobs, (310) 393-4552

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Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Microcomputer Managers Association							
P.O. Box 4615, Warren, NJ 07059 (908) 580-9091							
N/A	N/A	Multiple		Roger Bender	To be determined	Annual conference, monthly seminars, newsletters	MMA Office (908) 580-9091
Microsoft User Group Outreach Program							
One Microsoft Way, Redmond, WA 98052 (206) 882-8080							
N/A	N/A/ N/A	Microsoft	N/A	N/A	N/A	Provides information on 60 IBM PC based groups and 30 Macintosh groups	Tonya Dressel or Kira Sorensen (206) 882-8080
Mid-Atlantic Users Group							
51 Sleeper Street, Deerfield, MA 02108 (508) 940-2500							
None	125/ None	AGS Management Systems	AGS Management Systems products	Les Johnson	August 1992, Location to be determined	Meetings, news bulletins, on-line reporting system, product demonstrations	Les Johnson (617) 350-4933
Midwest DB2 User Group							
676 N. St. Clair Street, Suite 1765, Chicago, IL 60611							
\$50	600	Independent	DB2	Howard Fosdick Fosdick Consulting Villa Park, Ill	March 4 Chicago	Four meetings per year vendor fair, newsletter	Howard Fosdick (312) 644-6610
MISER Users Group Inc. (MUG)							
5008 08 Pine Creek Drive, Westerville, OH 43081 (614) 899-6301							
\$400	None/ 135	The Newtrend Group	MISER financial software package	Peter Weng, Berkeley Federal Savings and Loan, Milburn, N.J.	May 13-15, Lake Buena Vista, Fla	One annual meeting, quarterly newsletter	Richard Bannister (614) 899-6301
Motorola Computer Systems Users Group							
c/o Dan Russo, Motorola, 10700 North De Anza Boulevard, Cupertino, CA 95014 (408) 255-0900							
\$40	N/A/ 60	Motorola Computer Systems	All Motorola products	Harry Roberts, Info Dynamics, Waukegan, Ill	January 23, San Francisco	Annual conference	Dan Russo (408) 369-4306
MT Users Group							
Chuo Building No. 22, 2-11-8 Ginza, Chuo-ku, Tokyo 104, Japan (81) 3-3546-2705							
5,000/ 20,000 yen	6,000/ 120	Ricoh Co.	Ricoh personal computers	Haruo Ushio, Usio Electronic Co. Ltd.	July 25-26, Karatsu City	Information exchange, newsletter	Seichi Yoneyama, (81) 3-3546-2705
MUMPS Users' Group Brazil							
Rua das Marrecas, 25 Grupo 802, Rio de Janeiro, RJ 20031, Brazil (5521) 240-5020							
N/A	N/A/ N/A	Multiple	MUMPS computer language	Paulo Roberto Baratta	Unscheduled	Conference, seminars, journal textbooks, software	Paulo Roberto Baratta, (5521) 240-5020
MUMPS Users' Group Europe							
Erasmus University, Department of Medical Informatics, P.O.B. 1738, 3000 DR Rotterdam, The Netherlands							
N/A	N/A/ N/A	Multiple	MUMPS computer language		September 24-29, Nuremberg, Germany	Conference, seminars, journal textbooks, software	N/A
MUMPS Users' Group Japan							
MUG Building, 39-15 Daikan-cho, Nagoya 461, Japan (81) 52-936-5660							
N/A	N/A/ N/A	Multiple	MUMPS computer language	Ichiro Wakai, M.D.	Unscheduled	Conference, seminars, journal textbooks, software	Ichiro Wakai, (81) 52-936-5660
MUMPS Users' Group North America							
4321 Hartwick Road, Suite 100, College Park, MD 20740 (301) 779-6555							
\$60 Indiv / \$500 Corp	N/A/ N/A	Multiple	MUMPS computer language	Richard Davis, Information Systems, Boylston, Mass	June 15-19, Phoenix	Conference, seminars, journal textbooks, software	Faith Hall, (301) 779-6555

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Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
MUMPS Users' Group United Kingdom P.O. Box 51, High Wycombe, Bucks HP11 2HG, U.K. (44) 494 471 457							
N/A	N/A/ N/A	Multiple	MUMPS computer language	Daniel Sheehan, executive director	April 30, Location to be determined	Conference, seminars, journal textbooks, software	Daniel Sheehan, (44) 494 471 457
Nantucket Developers Conference 12555 W. Jefferson Boulevard, Los Angeles, CA 90066 (213) 390 7923							
By local group	N/A/	Nantucket	Clipper DBMS	N/A	Spring 1992, Location to be determined	Conference, information on over 79 groups	Natalie McNeal, (213) 390 7923, ext. 372
National Datapoint Users Group (NDUG) 8400 Datapoint Drive, San Antonio, TX 78229 (800) 733 1500 ext. 7376							
None	250/ N/A	Datapoint	All Datapoint products	Sue Farni, City of Mobile, Ala	N/A	Annual conference	Sue Farni, (205) 434 7830
National Epson Users Group (NEUG) P.O. Box 1076, Lemont, PA 16851 (814) 237 5511							
\$25	2,800/ N/A	Multiple	IBM compatibles	Richard Shoemaker	Undecided	Annual conference, newsletter, telephone support, software, product evaluations	Richard Shoemaker, (814) 237 5511
National Prime Users Group (NPUG) P.O. Box 697, Laurel, MD 20725 (301) 490 2056							
\$50	1,800/ None	Prime Computer	All Prime systems	Catherine VanOrman, USC Software System, Los Angeles	May 31-June 5, San Francisco	Annual conference, newsletter, BBS, library serviceboard	Judy Cook, (301) 490 2056
Net/Master Management Users Group (NMUG) Two Crown Point Drive, Suite 190, Cincinnati, OH 45241 (513) 772 9333							
None	150/ N/A	Systems Center	Net/Master, Sys/Master, Info/Master	Bob Gotthardt, Pennsylvania Power & Light, Allentown, Pa	June 2-5, Washington, D.C.	Two annual conferences, quarterly newsletter	Bob Gotthardt, (215) 774 4436
NetWare Users International (NUI) 122 East 1700 South, Provo, UT 84606 (800) 228 4NUI							
None	80,000/ N/A	Novell	NetWare	Hale Pringle	By chapter	Regional conferences, newsletter, technical database	Brian Smith, (800) 228 4NUI
Network Systems Corporation Users (NEXUS) 7600 Boone Avenue North, Brooklyn Park, MN 55428 (612) 424 1680							
None	None/ 323	Network Systems	All NSC products	Len Stans, Scandia National Labs	September 24-27, Location to be determined	Annual conference, newsletter	Shirley Gunderson (612) 424 1680
Network Users Group AT&T Inc. (NUGATT) P.O. Box 3565, Peoria, IL 61612 (309) 677 3450							
\$100	130/ 130	AT&T	AT&T LAN data communications	Stephen Patrick, Bradley University, Peoria, Ill.	May 17, San Diego	Two annual conferences, newsletter, BBS	Annette Patrick, (309) 677 3450
New Jersey PC User Group P.O. Box 14, Paramus, NJ 07653							
\$25	N/A	No affiliation	PC products	N/A	Second Thursday each month	Monthly meetings, newsletter, software, BBS	Ruth Lehmann (201) 261 3136
New York IBM Users Group (NYPC) 40 Wall Street, Suite 2124, New York, NY 10005 (212) 533 NYPC or (212) 686 NYPC							
\$35	3,000/ N/A	Multiple	IBM and compatible PCs	David Kleinman, DKI Inc., New York City	N/A	Monthly meetings, education seminars, 50 + SIGs, hotline, magazine, BBS	David Kleinman, (212) 686 NYPC

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Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
New York Macintosh Users Group (NYMUG) 688 6th Avenue, New York, NY 10010 (212) 691-0496							
\$40	3,000/ N/A	Apple Computer	Macintosh	Dan Peters	N/A	Monthly meetings, 23 SIGs, classes, newsletter, BBS	Maria Banks, (212) 691-0496
Norsk Computer Users Society (NOCUS) P.O. Box 44, Bogenrud 0621, Oslo 6 Norway (47) 262-8000							
1,200 Kroner	None/ 500	Norsk Data AS	All Norsk Data and Norsk Data-related products	Einar Li, Chairman	N/A	Four annual conferences newsletter	NOCUS Office, (47) 262-8000
North American Data General Users Group, Inc. (NADGUG) Livingston Building, Suite 250, 3420 Executive Center Drive, Austin, TX 78731 (800) 8-77-4787							
\$60	N/A/ None	Data General	All Data General products	Frank Perry	N/A	Annual conference, monthly magazine, software library, regional groups, SIGs	Greg Goss, (800) 877-4787
North American INGRES Users Association (NAIUA) 2500 Garden Road, Suite 208, Monterey, CA 93940 (408) 649-0644							
None	5,000/ N/A	Ingres/ ASK	Ingres and related software	Rick Angelini, U.S. Army Ballistics Research Lab, Bethesda, Md.	May 17-21, Tarpon Springs, Fla.	Annual conference, newsletter, local user groups	NAIUA office, (408) 649-0644
North American NCR Financial Users Group (NANCRFUG) 5008 08 Pine Creek Drive, Westerville, OH 43081 (614) 895-1280							
\$150	None/ 200	NCR	NCR hardware and financial software	Michel McKinney, Nashville Bank of South Carolina, Sumter, S.C.	October 18-21, Indianapolis	Annual conference, quarterly journal	James Bannister, (614) 895-1280
NorthEast SAS Users Group (NESUG) 74 Rosalind Street, Rochester, NY 14619 (716) 275-7712							
N/A	N/A	SAS Institute	SAS products	Gary Katsanis, Strong Memorial Hospital, Maria Wills SAS Consulting Group	N/A	Annual conference, quarterly newsletter, training	Gary Katsanis, (716) 275-7712 Maria Wills, (301) 881-8540
North Texas PC Users Group (214) 746-4699							
\$24	No affiliation	IBM and compatible computers		Jim Horington	2nd or 3rd Saturday of each month	Meetings, monthly newsletter, bulletin board	Hotline, (214) 746-4699
OASIS Computer Software Group P.O. Box 359, Norwalk, CT 06856 (203) 845-5167							
\$250	N/A	MUST Software Nomad software products International		Jim King, Boeing Computer Services, Seattle	May 31-June 4, Orlando, Fla.	Annual conference, quarterly newsletter, code sharing	Diane Parkes, (203) 845-5167
OASIS Users Group 1777 N. Kent Street, Arlington, VA 22209 (703) 841-6000							
None	User base/American N/A Management Systems	OASIS software		Jim Davis, Bibb County, Macon, Ga.	April 1992, Location to be announced	Annual conference	Dorothy Cotman, (703) 841-6391
opsXchange (the international OPS/MVS user group) 7965 N. High Street, Columbus, OH 43235							
N/A	N/A	Goal Systems International	OPS/MVS	Chuck Cottrell, Blue Cross/ Blue Shield of Virginia	N/A	Education and training on data center automation	Chuck Cottrell, (804) 354-4234
Paradox User Groups 1800 Green Hills Road, Scotts Valley, CA 95066 (408) 439-1065							
N/A	N/A	Borland International	Paradox	By individual group	By individual group	Information on 30+ regional groups	Tami Casey, (408) 439-1065

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PCS Users Group 600 McDonnell Boulevard, Hazelwood, MO 63041 (314) 234-1549							
N/A	N/A/ N/A	American Express Information Services	Comprehensive clinical information systems for order capture and results reporting	Janie Reed, Ottawa Civic Hospital, Ottawa	N/A	N/A	PCS Users Group, (314) 234-1549
Personnel Management User Group V.le Eginardo 29, 20149 Milan, Italy (39) 2-49931							
N/A	70/ N/A	Data Management	Data Management personnel management software packages	Mrs. Fernando DeNapoli, Data Management, Milan	N/A	Two conferences and two technical meetings per year, newsletters	Mrs. DeNapoli, (39) 2-49931
Phoenix Software International 5933 West Century Boulevard, Suite 1200, Los Angeles, CA 90045 (213) 338-0400							
None	Usr base/Phoenix N/A	Phoenix Software	All Phoenix products	N/A	N/A	Annual conference	Craig Becker, (213) 338-0400
Pilot Executive Software Systems User Group (PEISUG) 40 Broad Street, Boston, MA 02109 (617) 350-7035							
\$25	250/ None	Pilot Software	EIS and DSS software	Susan Eliot, UNUM Insurance Corp., Portland, Maine	To be determined	Annual conference, quarterly newsletter	Susan Eliot, (207) 770-2784
Primavera Users Group 2 Bala Plaza, Bala Cynwyd, PA 19004 (215) 667-8600							
None	Usr base/Primavera N/A	Primavera Systems	All Primavera software	N/A	August 30, September 2 Philadelphia	National conference, regional meetings, newsletter	Headquarters, (215) 667-8600
Project Management Users of Middle America (PUMA) c/o Gary Arnold, Federal Reserve Bank, P.O. Box 442, St. Louis, MO 63166 (314) 444-8633							
\$25	50	AGS Management Systems	AGS project management products	Gary Arnold, Federal Reserve Bank, St. Louis	September 21-22, Chicago	Meetings, news bulletin, project management tool demonstrations, information exchange	Gary Arnold, (314) 444-8633
Project Oriented Manufacturers Special Interest Group 2604 Highway 20, North Jamestown, ND 58401 (701) 252-6250							
\$200	N/A/ 30	Cincom Systems	CONTROL Manufacturing in IBM and DEC environments	Gary Weinberger, Lucas Western, Jamestown, N.D.	Unscheduled	Meets once a quarter	Gary Weinberger, (701) 252-6250
PSDI Users Forum 20 University Road, Cambridge, MA 02138 (617) 661-1444							
\$250	1,200/ N/A	PSDI	Project/2, Qwiknet professional	Dan Harrison	August 2-5, Charlotte, N.C.	Annual conference	Kristin Heath, (617) 661-1444
Pyramid Users Group (PUG) 1295 Charleston Road, Mountain View, CA 94043 (415) 335-8954							
None	350/ N/A	Pyramid Technology	All Pyramid products	Elaine Glowacki, Pyramid	May 13-15, Atlanta	Two annual conferences, newsletter, software tape, electronic mail network.	Carlin Swentzel, (415) 335-8954
RAMIS Roundtable c/o Alexis Christopher, FORUM International, 293 Savona Avenue, Goleta, CA 93117 (805) 967-5511 ext. 3570							
None	Usr base/Computer N/A	Associates International	RAMIS Information System and RAMIS/PC Workstation	Alexis Christopher, Raytheon, Goleta, Calif	To be decided	Annual conference, product enhancement survey, eight regional groups	Lisa Jones, (908) 874-7448
Relational Users Group (RUG) c/o Tidewater Consultants, 2700 South Quincy Street, Arlington, VA 22206 (703) 671-9500							
\$50	125/ N/A	Cincom Systems	SUPRA	Chuck Gross, Tidewater Consultants, Arlington, Va	N/A	Two annual conferences, newsletter	Chuck Gross, (703) 671-9500

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Annual Fee Individual/Corporate Membership Vendor Systems/Products Top Officer Next Meeting Services Provided Contact

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Research Triangle Area INGRES Users Association

P.O. Box 30754, Raleigh, NC 27622 (919) 787-8611

None	214/ None	Ingres/ASK	Ingres products	Jerry Holms, DBasics Inc., Raleigh, N.C.	Spring 1992 Location to be announced	Meetings, newsletter, product training	Janet Foushee, (919) 787-8611
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Ross Systems International User Group

555 Twin Dolphin Drive, Redwood City, CA 94065 (415) 593-2500 ext. 860

None	None/ N/A	Ross Systems	Financial management, accounting, human resources, distribution and manufacturing products, 4GL and business productivity software tools for the DEC market	Jan Keating, Armco, Inc., Middletown, Ohio	February 11-14, San Francisco	Annual national meeting, local meetings, executive user committee	Paula Shea or Catherine Cohen, (415) 593-2500 ext. 860
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San Francisco Personal Computer Users Group

3145 Geary Blvd., #155, San Francisco, CA 94118 (415) 221-9156

\$35	300/ 300	No affiliation	Software, equipment, supplies, accessories, etc. of use to PC users	Kendall Callas, MicroCounsel, San Francisco	3rd Monday of each month	Magazine, classes, hotline, software, product discounts, BBS, meetings	Kendall Callas, (415) 821-1310
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SAS User Group International (SUGI)

SAS Campus Drive, Cary, NC 27513 (919) 677-8000

None	N/A/	SAS Institute	All SAS products	E. Jeffrey Hutchinson, Intermec Corp., Everett, Wash.	April 12-15, Honolulu	Annual conference, quarterly magazine	Andrea Littleton, (919) 677-8000
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SEA User Group

2001 Marcus Avenue, Lake Success, NY 11042 (516) 328-7000

N/A	New grp.	Software Engineering of America	Software Engineering of America products	N/A	4th quarter 1992	N/A	Tom Mulvey, (516) 328-7000
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Sequent Users Resource Forum (SURF)

4100 East Mississippi Avenue, Suite 1717, Denver, CO 80222 (303) 758-9334

N/A	User base/Sequent N/A	Computer Systems	All Sequent products	Bob Foertsch, University of Illinois, Urbana, Ill.	Late September/ early October, Location to be determined	Annual conference	George Stadnik, (303) 758-9334
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SHARE

401 N. Michigan Avenue, Chicago, IL 60611 (312) 644-6610

\$250 (one- time fee)	None/ 2,600	IBM	IBM mainframe systems AS/400	Sandy Moy, University of Washington, Seattle	March 1-6, Anaheim, Calif.	Four annual conferences, technical reports, newsletter, reference manuals	Lynn Patton, (312) 644-6610
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SHARE European Association (SEAS)

18, rue des Moraines, CH-1227 Carouge, Switzerland (41) 22-300-3775

1,200 Swiss francs	N/A/ 521	IBM	Large scale and midrange IBM machines, including AS/400 and RS/6000	Barry Landy, University of Cambridge, Cambridge, England	March 30-April 3, Cannes, France	Two annual int'l conferences, newsletter	Marc Cattaneo, (41) 22-300-3775
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Silicon Valley Computer Society (SVCS)

2464 El Camino Real, Suite 190, Santa Clara, CA 95051 (408) 286-1271

\$30	700/ N/A	Multiple	PC compatibles and Macintosh	Bert Stephens, Stephens Engineering, Sunnyvale, Calif.	Not available	Meetings, newsletter, training program, BBS, discounts on trade shows, 15 SIGs	Bert Stephens, (408) 286-1271
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Softool Users Group

P.O. Box 729, Goleta, CA 93116 (805) 683-5777

None	User base/Softool N/A		All Softool products	Dorothy Huffman, Jet Propulsion Laboratory, Pasadena, Calif.	Spring 1992, Location to be announced	Annual conference	Sharon Gephart, (805) 683-5777
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1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Software 2000/UserNet 2000 Annual Conference One Park Center, Drawer 6000, Hyannis, MA 02601 (508) 778 2000							
\$795	\$300	Software 2000	Financial Management 2000, Human Resources 2000, Distribution Management 2000, Environmental Management 2000	Ann Marie Pearman, Mercy Healthcare, Sacramento, Calif.	May 17-21, Orlando, Fla.	Training, networking, tips and techniques product insight	Susan Vibberts, (508) 778 2000
SOTAS Users Group 262 North Delaware Avenue, North Massapequa, NY 11758 (212) 213 7674							
None	N/A/1,200	SOTAS International	SOTAS software packages for Wang VS and HP equipment	John Parisi, Sotas, North Massapequa, N.Y.	N/A	Annual conference, quarterly newsletter	John Parisi, (212) 213 7674
StorageTek Forum '92 2270 South 88th Street, MS4355, Louisville, CO 80028 (303) 673-4732							
None	N/A/N/A	Storage Technology	Large systems storage products	N/A	N/A	Annual conference	Renae Clark, (303) 673-4732
STRATEGY P.O. Box 685, Boston, MA 02102							
\$50 Indiv. \$200 Corp.	150/120	Stratus Computer	Stratus architecture	John Fisher, GTE Government Systems, Needham, Mass.	N/A	Annual conference, newsletter, local meetings, BBS	N/A
STROBE International User Group c/o Programart Corp., 124 Mount Auburn Street, Cambridge, MA 02138 (617) 661 3020							
None	N/A	Programart	The Strobe performance measurement system	N/A	Fall 1992	Conference	Helene Wolpe, (617) 661-3020
Sun User Group Inc. (SUG) 1330 Beacon Street, Suite 315, Brookline, MA 02146 (617) 232-0514							
\$40	7,000/N/A	Sun Microsystems	All Sun products	Peter Sallus, executive director	N/A	Annual conference, newsletter	(617) 232-0514
Sup'Eur Engineering & Theory Center Building, Cornell University, Ithaca, NY 14853							
None	N/A/N/A	No affiliation	Large-scale and numerically intensive computing on IBM systems	Prof. Bo Kagstrom, University of Umea, Sweden	September 13-16, Umea, Sweden	Annual conference, list servers SUPEUR and NIC-INFO	Robert Feldman, (607) 254 8888
Systems Center Users Conference 1800 Alexander Bell Drive, Reston, VA 22091 (703) 264-8000							
None	Usr base/Systems Center	All Systems Center products	N/A	N/A	N/A	Annual conference	Richard Smith, (703) 264-8000
Systems Management User Conference for Candle Customers 1999 Bundy Drive, Los Angeles, CA 90025 (310) 207-1400							
None	N/A/N/A	Candle	Systems management software for MVS, CICS, DB2, VM, IMS, VSE and VTAM	Aubrey Chernick, Chairman & CEO	December 1992, Location to be announced	Conference agenda and invitation	Karen Schaugg, (310) 207-1400
Tolas User Group GSI Transcomm, 1380 Old Freeport Road, Pittsburgh, PA 15238 (412) 963-6770							
None	Usr base/GSI Transcom	Tolas	None	None	March 1992, Location to be announced	Annual conference	Rhonda Rothbert, (412) 963-6770
Total Recovery Planning System User Group 300 S. Wacker Drive, Chicago, IL 60606 (800) 448-8777							
None	N/A	Chi/Cor Information Management	TRPS software	Sue Volpi, Total Petroleum	September 14-16, Chicago	Annual Conference	Mike Gomoll, (800) 448-8777 or (312) 322-0150
Trax User Group (TUG) 5840 Uplander Way, Culver City, CA 90230 (213) 649-5800							
None	Usr base/Trax Softworks	All Trax products	N/A	Chris Sligar, Bonneville Power Administration, Portland, Ore.	March 1992, Location to be determined	Annual conference, quarterly newsletter, user directory	Anne Sifferman, (213) 649-5800

1992 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee
Individual/Corporate
Membership

Vendor

Systems/Products

Top Officer

Next Meeting

Services Provided

Contact

TRIDEX (Tri-State DB2 Technology Exchange)

c/o Nanine C. Gallo, 4 Whitney Avenue, Pompton Lakes, NJ 07442 (201) 839-2922

None	N/A	Multiple	DB2, additional relational technologies and associated tools.	Nate Murphy Nate Murphy & Assoc. Mount Laurel, N.J.	February 6 New York City	Quarterly newsletter, quarterly meetings	Nanine C. Gallo (201) 839-3133
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UFO-COBOL/XE International User Group

c/o Computer Associates International Inc., P.O. 2392, Princeton, NJ 08543 (609) 799-6300 Ext. 6154

None	Usr base/Computer N/A	Associates International	UFO Productivity System and COBOL/XE	Dan Smith, Rival Manufacturing, Kansas City, Mo.	April 1992 Orlando, Fla.	Annual conference, product enhancement survey	Lisa Jones, (609) 799-6300, Ext. 6154
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Ungermann-Bass Users Group

3900 Freedom Circle, Santa Clara, CA 95052 (408) 562-7741 or (408) 987-6789

None	Usr base/Ungermann- N/A Bass	Bass	All Ungermann-Bass products	Greg Parcell, Chicago Board of Trade	May 31-June 4, Reston, Va.	Two annual conferences, newsletter	Deanne Deaville, (408) 562-7741
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UniForum Association

2901 Tasman Drive, Suite 201, Santa Clara, CA 95054 (408) 986-8840

\$50-100	6,881/ None	Multiple	All UNIX systems, open systems	John Oszbath, McDonald's Corp., Oak Brook, Ill.	January 21-23, San Francisco	Annual conference, UNIX products directory, updates on POSIX standards	UniForum office, (408) 986-8840, ext. 10
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Uninterruptible Uptime Users Group (UUUG)

P.O. Box 3743, Church Street Station, New York, NY 10008

N/A/ \$250	N/A/ \$250	Multiple	Critical Support Systems	Alan Freedman, Bankers Trust, New York	May 20-22, Newark, NJ	Newsletter, bulletin board, spring & fall conferences	Ken Brill, (505) 982-8300
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Unisys Users Association (UUA)

Bakers Court, Bakers Road, Uxbridge, UB8 1RJ England (44) 895-237-137

30-120 pounds	N/A/ 1,700	Unisys	Complete Unisys product line	A. Mendes dos Santos, Instituto de Formatica, Portugal	March 30-April 3, Amsterdam	Two annual conferences, newsletter, special reports	Lorna Wheatley, (44) 895-237-137, ext. 5418
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Unitech Systems Conference

3030 Warrenville Road, Lisle, IL 60532 (708) 505-1800

None	Usr base/Unitech N/A Systems	Unitech products	Unitech products	N/A	May 1992 Chicago	Annual conference	Joel Shufflin, (708) 505-1800
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United States Society of Wang Users

2138 South 61st Court, Chicago, IL 60650 (708) 652-3888

None	N/A/ 45	N/A	Wang Products	Matt Gillman	May 1992 Chicago	Information on regional groups	Wes Strickland, (708) 652-3888
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The Unity Users Group

51 Valley Stream Parkway, Malvern, PA 19355 (215) 296-6300

N/A	New grp /Shared Medical Systems	FMS, ACTION, EXACT software	FMS, ACTION, EXACT software	Dan Walsh, Mercy Catholic Medical Center, Philadelphia	April 5, San Francisco	One national meeting per year	Sue West or Bobbie Hippie, (215) 296-6300
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University UNIX System V Users Group (U3G)

AT&T, 225 Littleton Road, Room 51A 2B03, Morris Plains, NJ 07950 (201) 631-1857

None	400/ 200	AT&T	UNIX System V	None	N/A	Annual conference, newsletter	Annette Patrick, (309) 677-3450
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USE Inc.

Box 461, Bladensburg, MD 20710 (301) 699-9336

\$250 indiv \$750 vendor	None/ 625	Unsys Corp.	Unsys 1100/2200, 5000/6000/7000	Thomas R. Murphy, Naval Computer and Telecommunications Station, Newport, R.I.	April 27-May 1, San Francisco	Two annual conferences newsletter, program and video libraries, BBS	Carolyn Abell, (301) 699-9336
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1992 INTERNATIONAL USER GROUP DIRECTORY

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Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
USENIX Association 2560 9th Street, Suite 215, Berkeley, CA 94710 (415) 528-8649							
\$50/ \$300	4,700/ N/A	Multiple	UNIX and the C programming language	Kirk Marshall McKusick, University of California at Berkeley	January 20-24, San Francisco	Two annual conferences, workshops, newsletter	Conference office (714) 588-8649
USERS.PRL (LEVEL5 Expert System/PRL Users Group) P.O. Box 361262, Melbourne, FL 32936 (407) 242-4922							
\$10 (one-time fee)	845/ N/A	Information Builders	Level5	Gary Ribar, Peaf Marwick, Montvale, N.J.	April 26-May 1, Dallas; November 1992, Florida	One national conference, regional meetings, user directory	Lynn Girard, (407) 242-4922
Utility User Group (PSDI User Forum) 20 University Road, Cambridge, MA 02138 (617) 661-1444							
250	200/ N/A	PSDI	PSDI products	Tony Catanese	August 2-5, Charlotte, N.C.	Annual conference	Kristin Heath, (617) 661-1444
VIASOFT International User Conference 3033 N. 44th Street, Phoenix, AZ 85018 (602) 952-0050							
\$495	N/A	VIASOFT	Via Insight, Via SmartTest, VIA SmartEdit, VIA SmartDoc, VIA Renaissance	N/A	May 17-20, Scottsdale, Ariz.	Conference for the exchange of information	Maria Hoza, (602) 952-0050, or (800) 525-7775
VIP '92 Two Allegheny Center, Pittsburgh, PA 15212 (412) 442-1173 or (800) 323-2600 ext. 1173							
None	User base/Legend	Legend Corp.	Legend Corp. products	None	May 17-21, Orlando, Fla.	Annual conference, newsletter, regional meetings	Stephanie Schmaier, (412) 442-1173
Westchester PC Users Group (WPCUG) P.O. Box 349, White Plains, NY 10602 (914) 923-1337							
\$25	N/A/ N/A	Multiple	MS-DOS, UNIX, OS/2	Michael Friedman	Monthly meetings	Newsletter, helpline, SIGs, BBS, discounts	WPCUG office, (914) 923-1337
Xplor International (The Association for Electronic Document Printing Professionals) 2550 Via Trion, Suite 3L, P.O. Box 1501, Paeo Verde Estates, CA 90274 (213) 373-3633 or (800) 669-7567							
\$400	N/A/ 1,150	Multiple	Electronic document creation and printing products	Robert L. Stocks, Rohm & Haas Corp., Spring House, Pa.	June 1-5, Eindhoven, The Netherlands	Conferences, BBS, hotline, SIGs, professional publications, regional meetings	Jim Porter, (213) 373-3633
The X Windows Users Group (XUG) 2900 John Street, Unit 4, Markham, Ontario L3R 5G3 (416) 470-1203							
\$40	N/A	Any X Window vendor	X Windows systems/products	Jan Adamek	N/A	Luncheon meetings, programmers' workshops, information on X Windows	Ken Ristevski, (416) 470-1203
Zenith Users Group P.O. Box 217, Benton Harbor, MI 49023 (616) 982-3463							
\$22.95	11,000/ None	Zenith Data Systems	Zenith computers	Jim Buszkiewicz	None	Magazine, BBS, equipment discounts	Lisa Cobb, (616) 982-3463

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A CAVEIRO PUBLICATION

DATA MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

JANUARY 1, 1992

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vice president,
Borland International Inc.,
with Borland's C++

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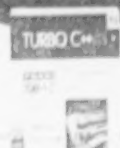
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JANUARY 1,
1992

DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

VOLUME 38
NUMBER 1



Borland's C++ is well suited to easing the way to OOP, offering a portfolio of new products, training, even videotapes.

COVER STORY

OBJECT-ORIENTED LANGUAGES

Borland's Bridge To OOP

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BY LEE THÉ Object-oriented technology promises greater programmer productivity and slashed maintenance costs. But for some procedural programmers, it's a bear to master. Borland's latest C++ bridges the OOP and procedural worlds by combining the advantages of each.

Cover photography by Brian Drake

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BY DATAMATION STAFF

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BY ELIZABETH LINDHOLM

A muscular processor, a souped up I/O and bus, true-color and 32-bit Ethernet networking add up to the fastest Mac ever—the Quadra.

Apple's Casanova claims the Quadra is "all Mac," but not an extension of the Mac II line.



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BY BOB FRANCIS Low-ball prices, mail order distribution, superstores—does this sound like the Compaq Computer Corp. of old? In an interview with DATAMATION, Compaq's new CEO, Eckhard Pfeiffer, maps out the big changes ahead.

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BY BOB FRANCIS Once linked exclusively to high-end technical shops, X terminals are moving fast into the front office with more low-priced offerings. Step aside, ASCII terminals—this X is meant for you.

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BY TOM McCUSKER Companies are saving money and getting better control by shipping facsimile traffic through LAN servers instead of stand-alone machines.

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BY NED SNELL Which tool to choose for software quality and testing? Users have a wide range of options, from those good old tried and true debuggers to some new, high-powered CASE systems.

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BY LEILA DAVIS Wasting too much time meeting Uncle Sam's hazardous materials exposure reporting requirements? New HR software helps you keep ahead of the EPA and OSHA.

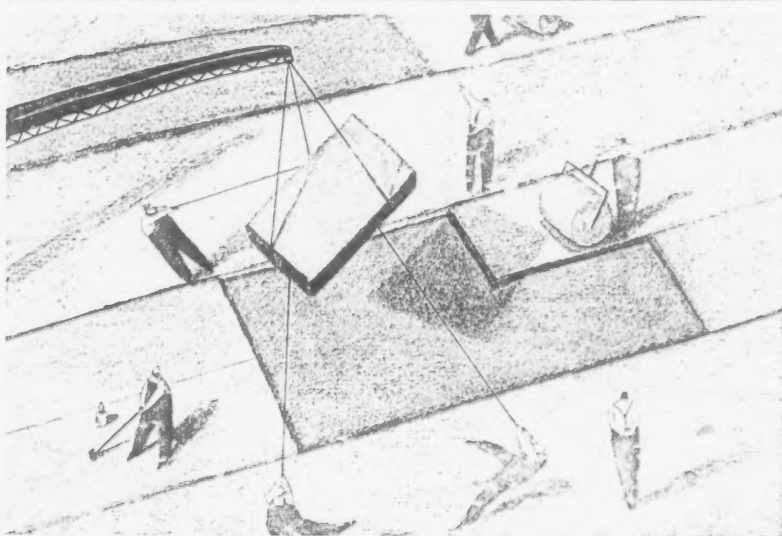
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**Building A Better
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BY JEFF MOAD Networking bottlenecks have throttled the power of UNIX servers when it comes to serving LAN-based PCs. Midrange system makers hope parallel versions of LAN products will overcome this problem.

INTERNATIONAL

Special supplement, not available in all issues 64-3



The road to multiprocessing UNIX systems may be paved with NetWare, page 61.



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1992 Industry Outlook

IS departments will run lean and mean in the coming year, their attention focused sharply on making the corporation more competitive.

Ladies and gentlemen of the IS industry: there are flickers of light at the end of the proverbial tunnel. While 1991 may be inscribed in the history books as the year of the Big Economic Squeeze, the new year may just witness a heightened sense of purpose among IS professionals about the use of information technology in their organizations and the standing of their shops within their companies.

What seems to be sparking this renewed sense of purpose is that, despite the weak economy, IS managers have decided that they just have to get on with it. Competitiveness must be improved, projects must be done and new technologies must be employed.

This is not to say that tough economic sledding won't continue into 1992. It will. The recovery from



last year's recession is occurring at a slower pace than most economists had predicted.

But Cahners Economics, a sister organization of DATAMATION, is forecasting a positive 2.6% growth rate in the Gross National Product (GNP)

this year, up from the 0.5% drop of 1991. And, in responses last summer to the DATAMATION/Cowen & Co. survey about IS buying intentions in the year ahead, IS managers indicated a "distinctly positive tilt" in spending plans for 1992.

These developments should be good news for IS managers, whose budgets, while under strong pressure, have held their own for the most part. Evidence of this surfaces in a new poll conducted in late fall by DATAMATION and the Business Research Group, also a sister organization of the magazine.

The survey shows a plurality of IS shops, 46% of those polled, expecting spending to remain the same this year as last, a year in which IS budgets grew only 3.4%. Thirty-four percent expect their expenditures to rise this year, and 16% expect to have fewer dollars to play with.

But even if IS managers won't have a lot more cash to spend, they seem focused on what they have to do with the resources at hand. The DATAMATION/BRG poll—which canvassed 150 IS managers, directors and vice presidents—gauged attitudes on key issues.

What emerges from this survey is the conclusion that traditional concerns with the operational efficiencies of IS

What's On The Menu For IS In 1992

DATAMATION/BRG survey shows IS managers rank corporate competitiveness tops.

% OF RESPONDENTS



IMPORTANCE Critical Very Somewhat Not

Source: DATAMATION, Business Research Group

shops have taken a back seat to improving the overall business performance of the company. Three out of the four most critical issues fell into this area. For example, 34% of the IS managers surveyed said using information technology to improve quality in their companies is critically important for 1992. Hard on the heels of this issue (although trailing behind the need to reduce costs) were reshaping business processes through the use of IT and using IT to improve the company's productivity, both checked off by 32.5% of those polled.

But when asked to pinpoint the most important issue they'll be facing in 1992, respondents offer up no clear consensus. At the top of the list is staying within budgets, but this box was checked off by only one in five. Another 14% stressed using IS more productively, and a further 11% felt the key issue is keeping up to date with emerging technologies.

Surprisingly, the much written about phenomenon of downsizing did not score high in the critically important category. Only 15% of those polled said the downsizing of computing resources was critically important in 1992. Twenty-four percent said it was not important at all.

When asked whether their shops had the re-

sources and expertise necessary to do the job in 1992, 76% said they do, and 37% indicated strong agreement. Seventy percent also agreed that they expect to see an improvement in the standing of their organizations in 1992.

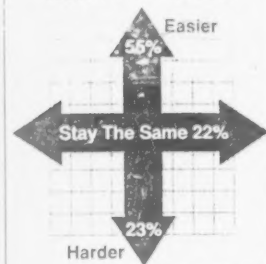
The technologies that will command the most attention this year have been prominent for at least the past couple of years. Local area networks, business applications and integrated network management topped the list of the most important technologies in 1992, with LANs garnering the highest percentage, 32%, of those polled.

In the following pages, DATAMATION's editorial staff reports on how all of the pressures that you're under in your organizations are affecting vendors' plans for new products in 1992. As you will see, vendors are feeling the heat to deliver better price/performance as you become more selective about new technology.

—David R. Brousell

Guarded Optimism About Corporate Budgets

In 1992, do you think it will be easier to get management support for IT activities?



Source: Datamation, BRG

PCs & WORKSTATIONS

The Big Boys Fight Back

As PCs become increasingly commodity-like and ever cheaper, major suppliers are attempting to differentiate their systems by building in more features, placing greater emphasis on software and seeking out new marketing channels.

Witness IBM. After 10 years, Big Blue's share of

the PC market was eroded last year by smaller, price-competitive PC manufacturers. "We've been slow in our time to market," admits Paul Mugge, vice president of IBM's Entry Systems Division. That's changing, he says, and IBM's PS/2 line should be evidence of that change this year. Its modular design will allow IBM to quickly launch new versions of these machines, incorporating the fastest processors and memory chips as they become available. IBM is also expected to aggressively roll out new portables this year, from laptops to pen-based systems, starting in Japan and spreading to the United States.

At Compaq Computer Corp., expect to see more entry-level products. "We have focused on the high end of the market, and that doesn't work in this price-conscious market," says Eckhard Pfeiffer, Compaq's new president and chief executive officer. (See article "Compaq's New CEO: A Focus On

Price.") Also expect Compaq to introduce products more quickly than before. New color notebooks could be out by the end of the first quarter.

Robert Frankenburg, vice president and general manager of Hewlett-Packard Co.'s Personal Information Products Group, admits that "the desktop business is tough," but says HP will emphasize new network-aware PCs and more capable servers. The firm will also concentrate on delivering more open system UNIX software, taking advantage of the Object Request Broker specification that allows distributed applications to interoperate across different vendors' hardware, beginning with UNIX systems.

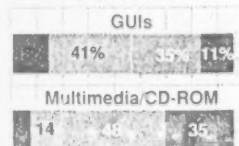
Digital Equipment Corp., which doubled its PC business in 1991 while playing catch-up with other suppliers, is more bullish on all of its desktop products. "I think we're in line for very solid growth this year," says Bradley Allen, Digital's manager of shareholder relations. Digital looks particularly to its high-end PCs, with built-in networking and large screens, to satisfy customer demand for PCs with workstation-like performance.

After an unprecedented year of new product introductions, Apple Computer Inc. is "going to keep the ball rolling even faster," says Bob Pucette, president of Apple U.S.A. Division. A lower weight PowerBook notebook could be on

Graphics Not Totally In The Picture

Graphical interfaces ranked as important, but not critical, in the DATAMATION/BRG survey.

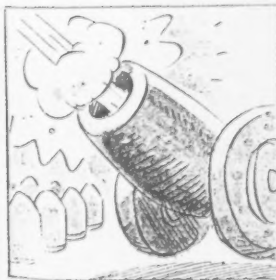
Multimedia is still on the back burner.



IMPORTANCE

■ Critical ■ Very
■ Somewhat ■ Not

Source: Datamation, BRG



the way by the middle of 1992, sources say, and a color version could roll out by the end of the year. Color could also show up on the low-end Macintosh Classic II desktop machine by the end of the year. Several machines based on Motorola Inc.'s 68040 chip will also be delivered this year. Macintosh machines based on the PowerPC RISC chip, however, are not expected until 1993.

We have focused on the high end of the market, and that doesn't work in this price-conscious market.

Apple/IBM agreement will send Apple users down the AIX path, probably with release A/UX 4.0. That should allow workstations with RS/6000 and PowerPC processors to run Apple applications. But A/UX 4.0 is not expected until 1993 at the earliest.

The Workstation Wars

Sun Microsystems Inc. hopes to continue fueling its growth through evolutionary extensions to existing products. For example, Sun is likely to introduce multiple processor versions of its workstations this

You could very quickly see Solaris becoming the dominant force in general purpose use on UNIX PCs.

year (the first MP servers were announced last fall), and also build multimedia features into the motherboard of all desktop systems. The Solaris 2.0 operating system should be ported to the Intel architecture by the second quarter of this year. "You could very quickly see Solaris becoming the dominant force in general purpose productivity use on [UNIX] PCs," says Alex Osadzinski, director of business development at Sun Microsystems Laboratories.

William J. Filip, president of IBM's Advanced Workstation division, says he doesn't plan to let IBM's workstation momentum slip. After some delays, an under-\$10,000 RISC workstation should be announced in the first quarter of this year. Says Lester Marcus, president of the New York/New Jersey AIX Users Group, "There are plenty of users who want a lower end machine to work with."

Besides the low-end RS/6000 unit, IBM is also expected to release some symmetric-multiprocessing hardware this year. To that end, the company has already released software that allows processors to work together, says Phil Hester, vice president, systems and technology, for IBM's Advanced Workstation Division in Austin, Texas. IBM is also working on its own distributed database, but it's unclear when the company might release it as a new product.

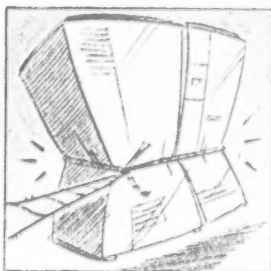
—Paul Pinella and Bob Francis

SYSTEMS

Tight Money For Big Iron

"The days of top management automatically approving data-processing spending have ended."

So says Ben Parke, president of Guidance For Users of Integrated Data-Processing Equipment Inc., or GUIDE, the IBM user group. And vendors are attempting to respond by making strides in price/performance ratios.



The mood of upper management at vendor companies is cautious: no one is inclined to forecast the end of the recession anytime soon. They're all too aware that many IT managers have reacted to the recession by postponing system purchase decisions. Now, says Robert J. LaBant, general manager of IBM's Application Business Systems division, who is responsible for the AS/400, "The question is: Are they going to make the [purchasing] decisions" or keep postponing them?

The stagnant economy notwithstanding, most vendors expect some upturn in their businesses, albeit slow. Midrange and peripherals vendors are depending upon new product introductions to shore up the bottom line. Mainframe suppliers, including

plug-compatible vendors Amdahl Corp. and Hitachi Data Systems Corp., should benefit as the transition that IBM began in September 1990 with the introduction of the FS/9000 nears completion.

At the midrange level, customers will require both more capacity and better links into enterprisewide networks, LaBant predicts. Expect to see improved interoperability between the AS/400 and PCs, and more. And expect the AS/400 to move up the performance curve.

On the mainframe side, IBM expects customers to demand larger mainframes to take care of consolidation and process reengineering. Marty Clague, assistant general manager for marketing of enterprise systems, says users' consolidation, process-reengineering and downsizing needs are boosting overall mainframe capacity to a 25% annual growth rate. Look for larger mainframes and new ways to interoperate mainframes with PC LANs, says Clague.

Unisys: Here To Stay?

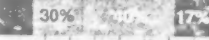
At Unisys Corp., the mainframe company is attempting to stanch the red ink.

"The big question you read in the papers is: Are

No Rush To Open Systems

Implementation of distributed processing, UNIX and open systems are not critical to IS managers for 1992.

Distributed Processing



UNIX/Migration To Open Systems



IMPORTANCE

■ Critical ■ Very
■ Somewhat ■ Not

Source: Datamation, BRG

they going to make it?" acknowledges Unisys president Reto Braun. "The answer is yes."

Braun says Unisys will have to continue to shed businesses and employees to cut debt further. The goal is a 20% debt-to-equity ratio by the end of 1993—down from 64% in late 1991.

Unisys's strategy is based on selling new products, upgrades and value-added services such as consulting and systems integration to existing customers. Unisys in October introduced a major upgrade to its 2200 mainframe line, the model 900, which includes many features so far only promised by competitors like IBM. Plans are to grow the 2200 even further, eventually to a 128-processor complex.

Midrange Battle

As Hewlett-Packard officials see it, downsizing and a palid economy are leading its managers to seek out one attribute: computing value.

If 1991 was HP's Year Of The Workstation, 1992 should be HP's Year Of The Multiuser computer. The company will significantly boost the performance of its base RISC processor technology and combine those new chips into larger, mainframe-class multiprocessor systems that run HP's MPE XL operating system. That means HP will be able to offer mainframe power for a quarter to a third the price of IBM mainframe MIPS, says Lewis E. Platt, HP's executive vice president for computer systems.

HP customers have ambivalent feelings about HP's drive toward open systems. Jane Copeland, chairwoman of HP user group Interex Inc., says users are concerned that they may be pushed into a premature transition to UNIX. "They know it's not an overnight task. And they're just not clear on how it can be accomplished," says Copeland.

HP may have a midrange systems battle on its hands with Digital Equipment, which last October introduced new VAX VMS 4000 and 6000 midrange systems. The VAX 4000 model 500 achieved a dollar-per-transaction-per-second rating of \$11,945—the best price per transaction to date in midranges.

NCR's New Economies

NCR Corp. is betting that customers are making "a fundamental transition to open systems," says chairman and CEO Gilbert P. Williamson. With its Intel microprocessor-based System 3000 family of computers, NCR is attempting to take advantage of the fact that "basic economies of standard microprocessors are competing with those of old mainframe electronics," he says.

NCR plans to make product announcements in virtually every category during 1992, Williamson says. These new releases are intended to combine the best aspects of NCR's current products with those of its new parent corporation, AT&T. NCR will continue to sell and support a number of AT&T products, but its goal is to gradually shift all users to System 3000 solutions. Expect NCR's top-of-the-line, massively parallel System 3700 by the end of the year, also expect to see release 2 of NCR's Cooperation office automation software during the second quarter.

—Jeff Moad, Dwight Davis and Elaine Appleton

SOFTWARE

PC, Mainframe Join Hands

"There's more change going on in the software industry today than I've seen in my entire experience in the business over the past 20 years," says John Landry, chief technology officer for Lotus Development Corp.

Landry says dramatic changes in computer hardware technology are forcing the industry's two independent camps—large-system enterprise software companies such as D&B and Computer Associates International Inc., and small-system LAN-PC software vendors like Borland International Inc., Lotus Development Corp. and Microsoft Corp.—to begin to join forces.

The reason: three technologies critical to successful enterprise computing have become commercially viable PC products. These technologies—graphical user interfaces, LAN systems and PC-LAN-based database management systems—are finally letting desktop computers compete technically with enterprise database management systems, but at a much lower cost.

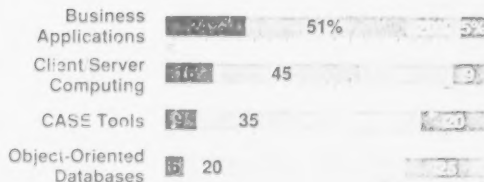
Computer Associates has made a renewed commitment to competing aggressively in the desktop market. Chairman and CEO Charles Wang says that his long-term goal is to have PC-related business represent 25% of CA's business overall, with mainframe, UNIX and other software constituting the remaining three-quarters. Personal computer software, which Computer Associates has been selling since the early 1980s, currently represents 10 to 15% of the company's overall business, which totaled \$1.3 billion in calendar 1990.

Lotus president Jim Manzi expects "double-digit



What's Hot In Software

Business applications and client/server computing are priorities for 1992 in the DATAMATION/BRG survey



IMPORTANCE Critical Very Somewhat Not

Source: Datamation, BRG

revenue growth in 1992," in great part thanks to increases in sales of Notes and cc-Mail. "We have several large Notes orders pending and expect our joint sales and marketing agreement with IBM to drive significant sales in '92."

Werner Frank, executive vice president of systems software vendor Sterling Software Inc. agrees with the trends mentioned by Lotus's Landry: "There are some very dramatic changes going on outside our traditional area of MVS and VSE IBM mainframe systems applications. 'The most important for us in the future will be in the mixed LAN environments of DOS and OS/2, perhaps in UNIX,'" he says.

Stepping Into PC LANs

Other veteran mainframe software companies—including Legent Corp. and Software AG—are also making major efforts to redirect product development to the PC-LAN arena.

Says John F. Burton, Legent's president and chief operating officer: "We've stepped into client/server technologies whole hog; we have all three of our development labs now working on PC products." Burton says 1992 will be the year when the company finally can ship a wide range of PC versions of its

Make sure that each step fits in a direction you won't have to retrace in a year or two.

previously mainframe-based system management software. Legent saw revenue growth of 20% in 1991 as a result of several new product announcements, despite a brief pause in growth in the second and third quarters. This year, Burton expects sales to increase by 25%.

Worldwide large-systems vendor Software AG has also made a strong commitment to moving all of its products to smaller systems and PC LANs. The company has an overall product direction—dubbed the Entire Function Server—by which all of its products are meant to communicate with other vendors' software products across several platforms and communications systems on networks.

President and CEO Mike King expects Software AG's 1992 sales growth to replicate 1991's 15 to 20% rate. He believes cost pressures on users will continue to force them to look more seriously at implementing smaller systems. But he cautions users to go slow in making cost reduction decisions. "If I were advising users," he says, "I'd tell them: let's take it one tangible step at a time. Make sure that each step fits in a direction you won't have to retrace in a year or two. Stick to the existing or emerging standards, to be on the safe side."

—Bill Semich and Lee The

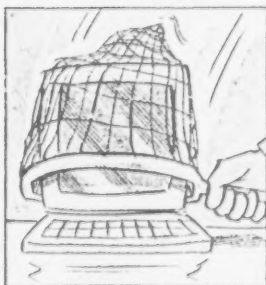
NETWORKS

IS Casts A Bigger Net

"People talked for a long time about the year of the LAN. Now we look back, and it happened," says B.D. Johnson, vice president of product marketing at Banyan Systems Inc.

And most networking vendors expect it to keep happening. Network expansion and development is high on many corporations' lists of IT tasks to accomplish for the next several years. John Edwards, director of marketing for LAN leader Novell Inc., says he agrees with many analysts who expect LAN vendors to grow 20 to 30% annually. Novell will do better than that in the coming year, as revenues swell as much as 40% from the acquisition of Digital Research Inc. But, generally, the firm is on a 30% track for the near future.

Along with a tilt toward more critical apps on networks comes a need for more sophisticated network management. Multivendor management will get a lot of attention from network software vendors in 1992, with emphasis both on standards—notably, the Simple Network Management Protocol (SNMP)—and on integration of smaller networks into larger, corporatewide networks.



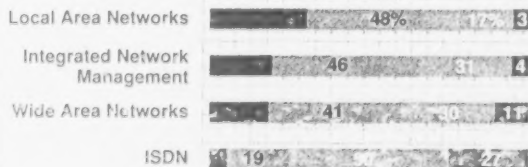
Novell will be rolling out software to link its management applications to IBM's NetView network management product. That will enable users to completely centralize network management or to take advantage of both centralized (NetView) and distributed net management. The October 1991 agreement between Novell and Eastman Kodak Co. making NetWare more image-capable should bear fruit in 1992.

As for NetWare itself, 1992 will be a big year. Version 3.2 should be out in the second half, bringing NetWare to the OS/2 environment. An OS/2 2.0 requester will be shipped earlier, when IBM ships the production version of the OS/2 2.0 operating system. And further cementing the Big Blue relationship, Novell will ship NetWare for AIX next year.

The trend toward larger, more enterprisewide

What's Hot In Networking

The DATAMATION/BRG survey indicates IS managers pressing ahead with LANs in 1992.



IMPORTANCE ■ Critical ■ Very ■ Somewhat ■ Not

Source: Datamation, BRG

SPECIAL REPORT

FORECAST

networks could help firms like Banyan. An alliance with The Santa Cruz Operation Inc. will mean that Banyan's VINES will be able to run on SCO UNIX System V release 4 for Intel-based servers, broadening Banyan's standards base. Johnson sees open UNIX as the foundation for several new products in 1992.

In 1992, one of Banyan's big projects will be to commercialize its version of the Open Software Foundation's Distributed Management Environment (DME).

Customers don't know what to do with 44.7 megabits per second of bandwidth yet.

The LAN explosion is spreading out over the wide area network, increasing WAN traffic from LAN interconnections, says John Petrillo, vice president for business communications services at AT&T. AT&T also sees a lot of growth in wide area e-mail traffic. Certain industries, such as insurance, are doing a lot more on-line transactions between branch and back office systems. But those who expected to see WANs gobbling up T3 circuits will be disappointed. T3 is not burgeoning, Petrillo says. "Customers don't know what to do" with 44.7 megabits per second of bandwidth yet.

Petrillo sees customization as the key to satisfying corporate data network needs. "Most private nets

Multivendor management will get a lot of attention from network software vendors in 1992.

today are a comingling of private lines and frame relay and packet services," he points out. AT&T will deliver 60 high-speed packet services over private lines in the first half of 1992, using frame relay access at 56 kilobits per second and up. Customers will then have multiple frame relay options, both public switched and private, for digital networking.

Growth In Digital Nets

George Grumbles, president of IDS-Motorola, also sees growth in digital networking equipment. He says the company will continue to emphasize digital products. Revenue from digital products represents 15 to 20% of IDS's revenue base, compared with zero a half-dozen years ago.

T1 growth notwithstanding, analog transmission isn't dead. Look for IDS to introduce a V-Fast (24,000bps) modem in 1992, "which may or may not be the last analog frontier," says Grumbles. "It's going to be a very technologically driven product."

Per Suneby, director of business development with Motorola Codex, already sees an uptick in the market for WAN equipment. Suneby thinks that "1992 will be a real year for frame relay services. Frame relay will arrive in real terms." Codex will be part of that trend, introducing more frame relay capabilities for its products in 1992.

—Tom McCusker and Mark Schlack

FANTASTIC!

PC Transformed Into X

TERMINAL!

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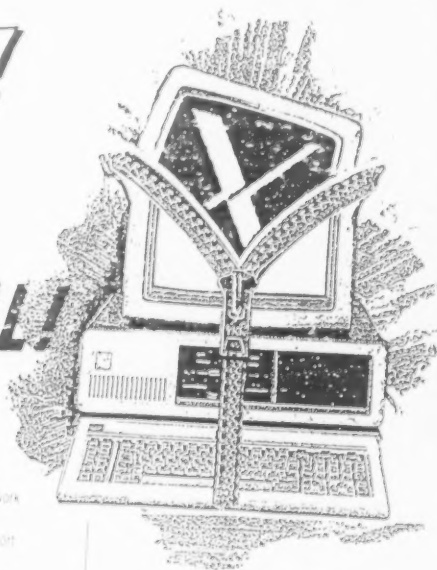
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■ EUROPE

The Great OSI In The Sky

Can your company wait for the promised land of Open Systems Interconnection, or will you actually have more flexibility by sticking with a more proprietary approach?

BY FRED GUTERL

It's been in the works since 1977. A first draft was produced the following year. But not until 1984 did it attain the status of an international standard, and not for two more years were any products available. Now, 15 years after its conception, Open Systems Interconnection—the idea of exchanging data between a host of dissimilar computers in a multivendor environment—remains as much a promise as a reality.

By now, it's an old, old story. Many—but not all—of the standards have been established that make up the seven-layer OSI Reference Model. Many—but not nearly enough—products have come on the market that would make the standards a reality. And, of course, alternatives more tried and true exist for those who have to get their work done today.

There's no denying that IBM's Systems Network Architecture (SNA), which predates OSI, is here now and is well-established and robust, if proprietary. And the Transmission Control Protocol/Internet Protocol (TCP/IP) UNIX standard has taken root as a popular alternative to OSI's middle network and transport layers, layers 3 and 4.

Why OSI?

Nevertheless, vendors and users agree that OSI will be the way to go in the long run. And the benefits then should be legion—the widest possible choice of hardware, software and applications; the ability to link diverse, already existing systems together into a seamless whole; freedom from the grip of a single vendor's products, prices and architectural whims.

So the question is, are the benefits so great that they're worth the wait? And what are the costs in the meantime?

Hoechst AG, the German steel com-

pany based in Frankfurt is moving toward a complete and comprehensive commitment to open systems. Six years ago, Hoechst initiated a plan to move its entire computing operations to open systems as quickly as possible by restricting all network purchases to OSI products. Since the decision came from top management, IT managers at the company enjoy "the freedom to invest in what we think is right in the long run," says head of networking Harald Nottebohm.

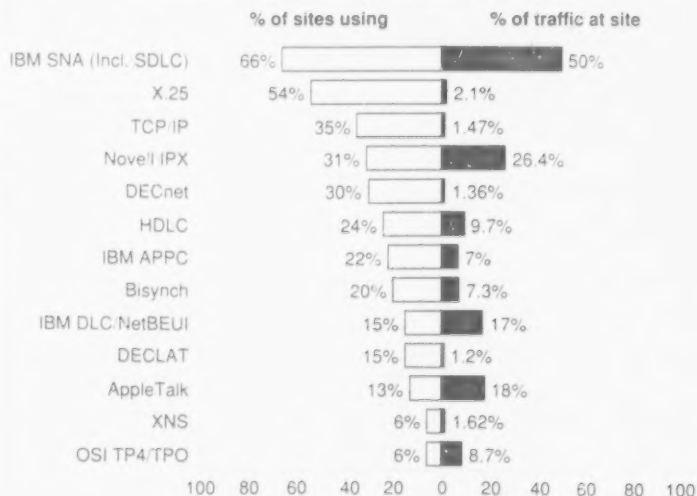
Despite this solid corporate backing, the process of converting from closed to open systems has been laborious. Before deciding to go with open systems, Hoechst had invested hundreds of millions of deutsche marks in seven different computing architectures—one each from Digital Equipment Corp., IBM, Hewlett-Packard Co., NV Philips' G4 and Siemens Nixdorf Informationssysteme AG, as well as two from Unisys Corp. The option of throwing any of it out and starting again with compatible systems was untenable. The expense aside, Hoechst could not even begin to muster the expertise needed to redesign so vast a network, says Nottebohm. In addition, the company needed time to nurture crucial experience among its staff in dealing with OSI standards and in de facto open standards like UNIX. So, slowly over the six years, Hoechst has been buying only hardware and software that conforms to OSI standards with the aim of eventually getting all of its existing systems to interoperate through the OSI model.

Nottebohm admits the policy causes delays in deploying new computers in the organization; sometimes he has to search far and wide for an OSI version of a

Protocol Popularity Poll

OSI, and the X.25 and TP4/TPO protocols that run on it, might be in European users' thoughts, but SNA is on their networks, as results from a recent survey of 500 European IS execs show.

TYPES OF NETWORK PROTOCOLS CURRENTLY IN USE ON DEPARTMENT OR CORPORATE NETWORKS



Source: Business Research Group

needed network element. This problem occurs particularly when vendors fail to fulfill their promises to deliver open systems products on time or, more often, when the company's experts are forced to grapple with unfamiliar problems.

Hoechst is only now beginning to reap the benefits of its OSI investments. In the next few years, Nottebohm expects to see a reduction in the high cost of maintaining various architectures as more and more of the networking conforms to OSI standards. At that point, his dependence on gateways to achieve multivendor interoperability should decrease. A recent Frankfurt University study estimated that Hoechst spends DM500,000 each year on gateways to link its various architectures. (IBM's gateways, Nottebohm says, are the most expensive.)

Nottebohm fumes over computer vendors' reluctance to wean customers from proprietary products. "OSI is going to happen, but it could be happening much faster. The vendors spend too many resources on proprietary systems to lock in customers. And users expend too much energy in overcoming these same barriers."

IBM, which has more than 500 engineers at its Rome laboratories doing nothing but developing OSI products, nevertheless defends its proprietary approaches. Big Blue argues that OSI-compliant networks will never provide the depth of functionality that proprietary architectures do. "If we want to

**I cannot afford to be
a purist. I wouldn't be
around two years
from now.**



change SNA to suit our customers' needs, we can do it more effectively because we don't have to consult a committee," says John Gallop, director of systems network operations at IBM in La Gaude, France.

Can't Wait

This is an argument that carries weight with Peter Entwistle, assistant general manager at Lloyds's Bank in London. Information technology is so important to his firm's competitive edge, says Entwistle, that to delay implementing the best solution for the sake of open systems is unthinkable. "If my business clients [within Lloyds] need something to meet their business goals, I cannot afford to be a purist," he says. "I wouldn't be around two years from now."

Half of Lloyds's network, which links

What Your Colleagues Are Doing

Few would doubt that Europeans are among the strongest supporters of the Open Systems Interconnection model for multivendor connectivity. But a new survey of over 500 executives in seven European countries shows IBM's Systems Network Architecture still firmly entrenched in the enterprise networks.

The survey, conducted by the Newton, Mass.-based Business Research Group, a sister organization of DATAMATION, shows that fully 75% of respondents have enterprise networks in place. Of that group, 66% not only currently use, but have standardized on, SNA network protocols, which account for 50% of all traffic.

The OSI-approved X.25 protocol is a standard on 54% of respondents' networks, but carries only 2.1% of all traffic. And although respondents are using the Transmission Control Protocol/Internet Protocol (TCP/IP) in 35% of their enterprise networks, that alternative to OSI's transport and network standards accounts for a mere 1.47% of traffic at those sites. Contrary to many analysts' expectations, only 12% of respondents are implementing TCP/IP as a migration strategy to OSI, the same percentage that have standardized on TCP/IP as a LAN operating system.

Still, support for OSI is out there: 51% of respondents say OSI solutions are more important than non-OSI solutions in enterprise computing. But the fact that network security and fast-changing technology top the list of problems that these respondents have in integrating their networks and systems may hint at a level of exasperation with the current state of the open systems concept.

—Andrea Ovans

For more information on the BRG report, "Network Integration Europe: User Trends," call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158 U.S.A.

the firm's branches throughout Britain, is based on IBM mainframes and SNA, the rest on a mix of primarily proprietary products from other vendors. Still, connectivity is not as difficult an issue for Lloyds as it is for the many European companies that have had to meld totally separate systems acquired through mergers and acquisitions. What matters most to Entwistle in managing his single enterprise network is having a wide choice in selecting suppliers.

Ironically, that's led Lloyds to favor proprietary solutions. Many vendors supply equipment for IBM's SNA or manufacture clones of IBM mainframes. Hastily adopting OSI standards would in some cases actually reduce choice, Entwistle argues. For instance, vendors vary so widely in their implementation of X.25 protocols, which are part of the OSI model for linking data terminals to packet-switched networks, that adopting them would lock him into a single vendor even more than would sticking with SNA.

Entwistle does not completely discount the open systems idea and admits to be gently edging the company in that direction for the long term. But he is deeply skeptical of the promises being made at present. "You won't find me making religious statements," he says. "I don't see

the great utopia where one can connect anything to anything else."

Many users are looking to OSI standards not so much to get their various computer products to communicate with each other as to make it easier to port applications from one machine to another. Peter Clotten, vice president for information technology at the German chemical firm Wacker-Chemie AG of Munich, is set on replacing his firm's MS-DOS and OS/2 workstations with OSI-compliant UNIX workstations. "I really need open systems so we can take applications from one workstation to another," he says. However, he has decided to wait until sufficient administrative applications are available for UNIX. And he expects he'll have to wait another three years. "Then we will make a smooth transition," he says.

At the large-system level, Clotten is currently satisfied with relying primarily on IBM 3090 mainframes. However, when the machines begin to become obsolete in another five to seven years, he would like to strip them of their applications software and move those functions down to UNIX systems. Instead, he suspects, mainframes will serve as repositories for corporate data for a long time to come.

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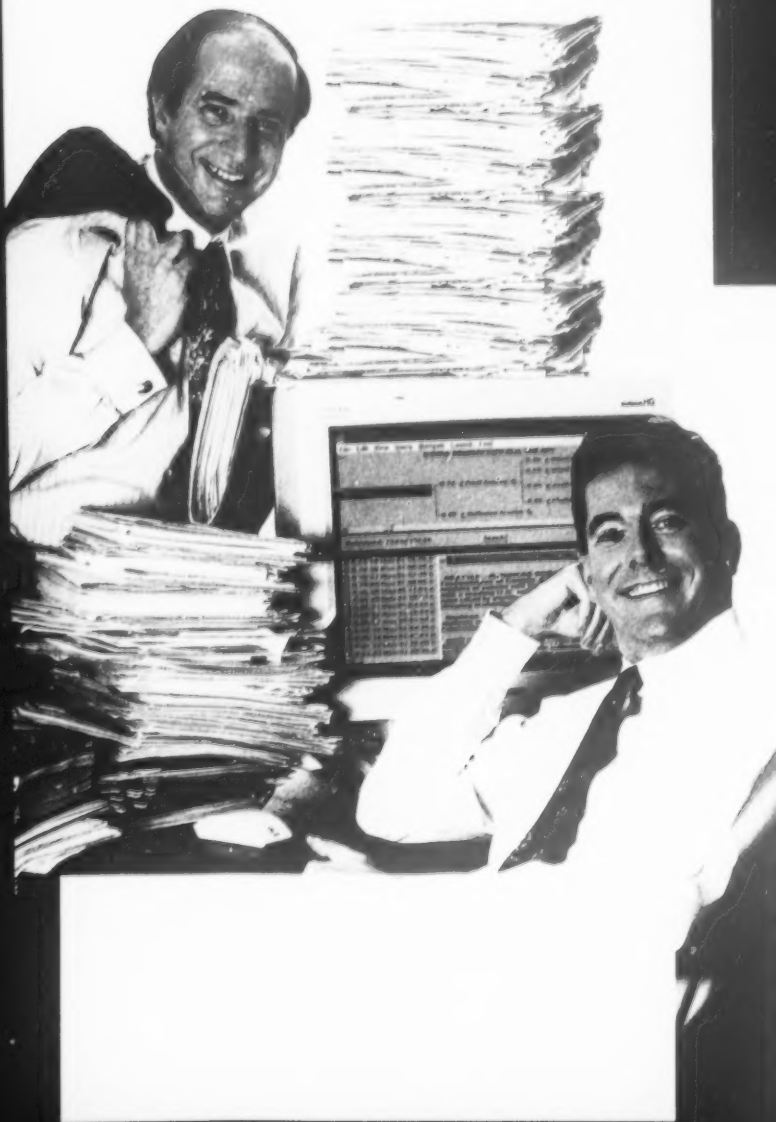
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DATA MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

JANUARY 15, 1992

Michael S. Pliner (l.),
president & CEO,
and Clifford A. Reid (r.),
VP of product development, Verity Inc.,
with TOPIC, text retrieval software



Smart Document Retrieval!

page 20

PC Mapping Charts
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BEST OF BREED
FROM
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page 58

JANUARY 15,
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DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

VOLUME 38
NUMBER 2



Verity's TOPIC helps IS professionals find out what they don't know they don't know.

COVER STORY

INFORMATION RETRIEVAL

Smart Document Retrieval!

20

BY ELAINE L. APPLETON With innovative "concept-retrieval" software that runs on a half-dozen user interfaces, Verity is trying to help IS managers conquer document retrieval. Easier said than done.

Cover photography by Chris Springmann

SPECIAL REPORT

COMDEX NEW
PRODUCTS

Best Of Breed From COMDEX 58

BY DATAMATION
STAFF

The future of PCs was everywhere to be seen within thousands of new products at COMDEX. For IS, the crystal ball is filled with images of Windows, OS/2, powerful notebooks, multiprocessor servers—and, just for fun, multimedia.

PRODUCT GUIDE

FEATURE

VAX 6000 Gets High Marks 55

BY SARAH H. LINDSEY
Digital Equipment Corp. believes the VAX 6000 model 600, with speeds up to three times as fast as current models, can take on the competition.

Digital's Nist expects the VAX 6000 model 600 to compete against RISC machines.



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PCs & WORKSTATIONS

MAPPING SOFTWARE PC Mapping Charts A New Course 27

BY LEE THE Once the province of specialists, desktop-mapping software is gaining in importance as a general purpose decision support and presentation tool linked to corporate databases.

OPERATING SYSTEMS Will Sun's Solaris Succeed On PCs? 33

BY RICK COOK Suddenly, out of the blue, there's another desktop operating system to consider. Solaris 2.0 is a no-brainer for SPARC, but getting non-Sun customers excited will take more than technical merit.

NETWORKS

INTEGRATION IS Has A New Job In Manufacturing 38

BY MARK SCHLACK Global competition has given IS a new mission: breaking down the barriers between the plant, office and design center to speed product development and boost quality.

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MANUFACTURING Connect Manufacturing To The Enterprise 42

BY MIKE RICCIUTI Users of manufacturing software have spoken: they want distributed, easily portable and interoperable manufacturing software. Vendors have answered with Enterprise Resource Planning.

SYSTEMS

BENCHMARKS The Mainframe Performance Debate 47

BY JEFF MOAD It's an old story: there are lies, damn lies—and statistics. In the face of an increasingly complex mainframe world, users are crying out for standard, auditable benchmarks.



Xerox's Siriano is driven to be "vendor-independent," page 38.



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Multimedia Is Almost Here

The Laser War In Peripherals



DATAMATION staffers selected almost 100 of the most promising new products from a crowded field, page 58.

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MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

Networks Fly With FDDI

BY WARREN CHILDS AND KATHRYN A. TITO

Business Research Group

Installation of Fiber Distributed Data Interface (FDDI) technology in networking environments is burgeoning, as businesses employ more applications on local area networks that require higher bandwidth. Using LANs for client-server computing applications or to transmit complex data types such as images, sound and video all require the high 100-megabit-per-second transmission capacity that FDDI offers in order to run smoothly and not bog down the network. In comparison, Ethernet and Token Ring standards top out at only 16Mbps.

The latest survey of the DATAMATION Technology Panel shows that 42% of panel members either have implemented or plan to implement FDDI. Most plan to implement it for campuswide networks to interconnect LANs between buildings inside a six-mile radius. Fiber is especially well matched for this type of networking because of its bandwidth capacity and its

inherent security from electrical interference.

One-third of those planning to use FDDI say they will primarily use it to interconnect LANs within the same building. Another 10% will use it principally to implement a metropolitan area network (MAN).

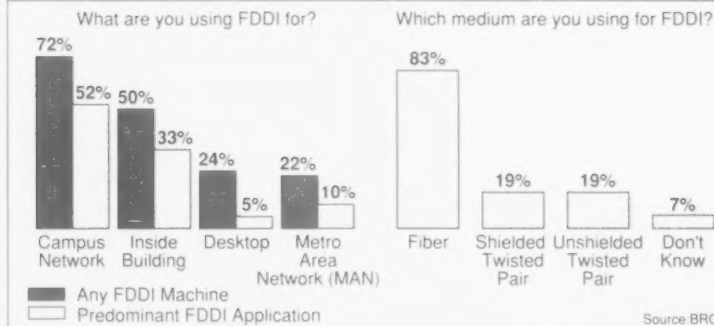
The high cost of replacing copper cable with fiber is keeping most users from bringing FDDI to the desktop. But recently developed FDDI twisted pair technology will make it more feasible to bring 100Mbps bandwidth to the desktop,

since most buildings already possess twisted pair wiring installed for telephone systems.

Although the growth outlook for FDDI remains strong, the significant investment in Ethernet and Token Ring technologies will relegate initial FDDI growth to LAN internetworking.

For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

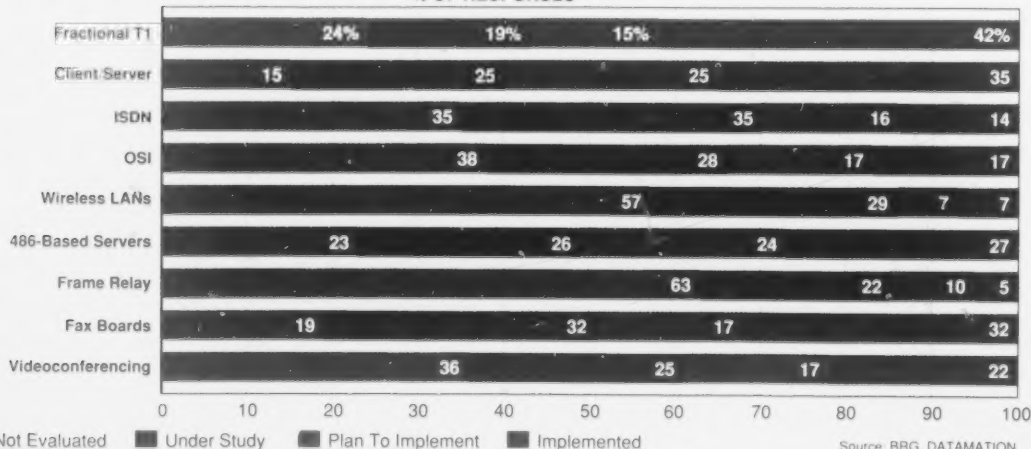
Add Some Fiber To Your Network



DATAMATION's Technology Implementation Index: Networks And Communications

DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

% OF RESPONSES



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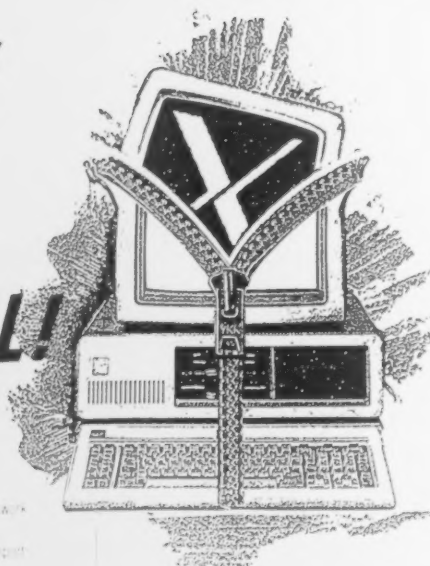
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FEBRUARY 1, 1992

Donal O'Shea,
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Servio Corp.,
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PCs Tool Up For Hypertext 35

BY LEE THÉ Although they're no panacea, today's new PC-based hypertext tools can help breathe new life into seldom-used paper and electronic documents.

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Wireless Works, Within Limits 38

BY SUSAN KERR Wireless LANs can solve cabling costs for work groups, but lack of standards and performance limits lurk as potential problems.

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Power-Packed OS/2 Tools For LANs 43

BY PAUL PINELLA Just in time for OS/2 2.0, along comes a crew of hard-working client/server programming tools that mean business.

SYSTEMS

MAINFRAMES

Showtime For The NCR 3600 50

BY DWIGHT B. DAVIS Positioned as a general-purpose mainframe-class machine, NCR's new massively parallel computer must prove that it can live up to all the hype.



NCR's Lambert has set a very aggressive schedule, page 50.

OS/2

Get Your CICS On OS/2 54

BY DWIGHT B. DAVIS The OS/2 version of CICS lets users off-load mainframe OLTP applications and develop new programs. But some holes remain in its feature suite.

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Unum's Bakman has built a claims management system running IBM's Database Manager, page 43.



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MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

Smart Users Find Telco Alternatives

BY WARREN CHILDS AND
KATHRYN A. TITO
Business Research Group

When it comes to connecting up voice and data networks to interexchange carriers, a strong minority of users are choosing to supplement or bypass entirely their local telecommunications companies and turn instead to alternate access providers. AAPs specialize in digital, nonswitched point-to-point local access to long-distance telecommunications carriers.

A recent survey by the Business Research Group has found that of 100 companies with large data-networking needs, 18% currently use AAPs for either voice or data applications. That's a healthy chunk considering the limited availability of AAP services.

When asked what criteria they used to decide whether to sign up for services from their local telephone company or from an AAP, respondents most frequently said cost of service (48%) and quality of service (39%).

In both of these areas, AAPs have an

advantage; they must be low priced to compete with the wide range of services available from the local telcos, and they can offer the high quality that comes with fiber-optic networks.

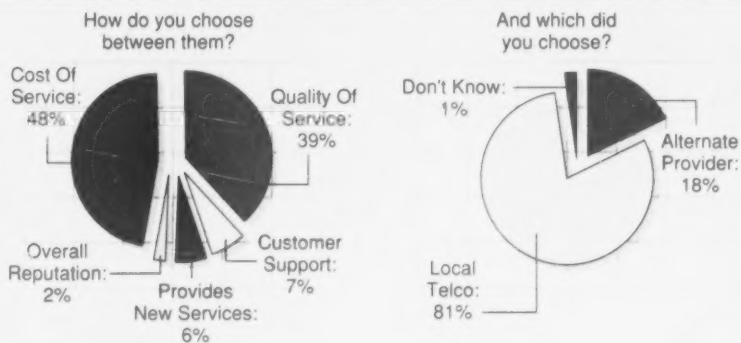
In addition, MIS managers are attracted to AAPs because their fiber-based metropolitan network services offer a way to link users' city locations on a high-bandwidth, all-digital system. AAPs also offer a low-cost way for users to diversify network routes by combining AAP and telco services. Route diversity offers a

safeguard should there be trouble on either the AAP or local telephone company network.

AAP fiber-based networks are now available in most major cities. Metropolitan Fiber Systems Inc. of Oakbrook Terrace, Ill., and Teleport Communications Group in Staten Island, N.Y., are the two leading AAP companies.

Local telephone companies are beginning to be hurt by the increase in the number of users bypassing their networks in favor of AAPs.

Local Telcos Versus Alternate Access Providers



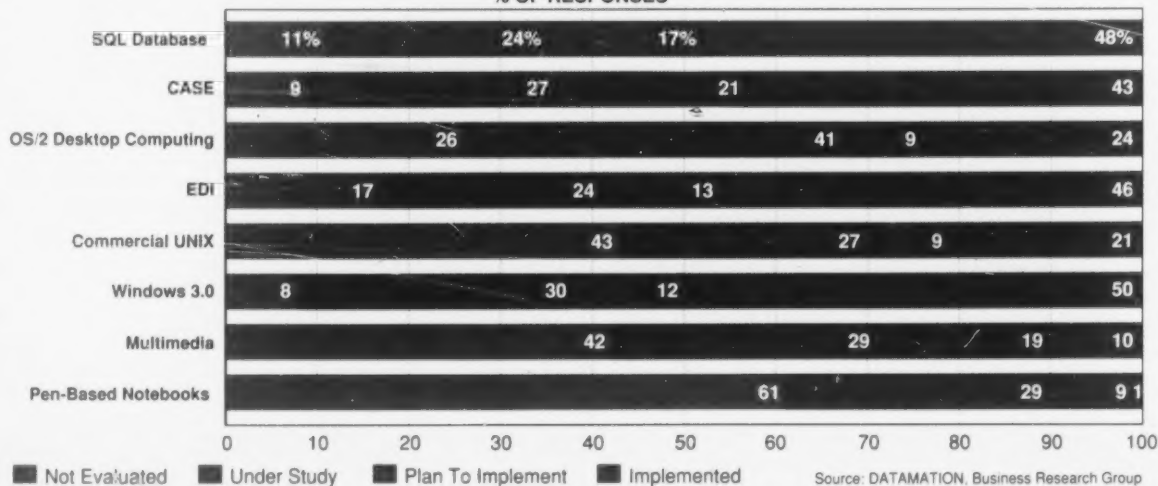
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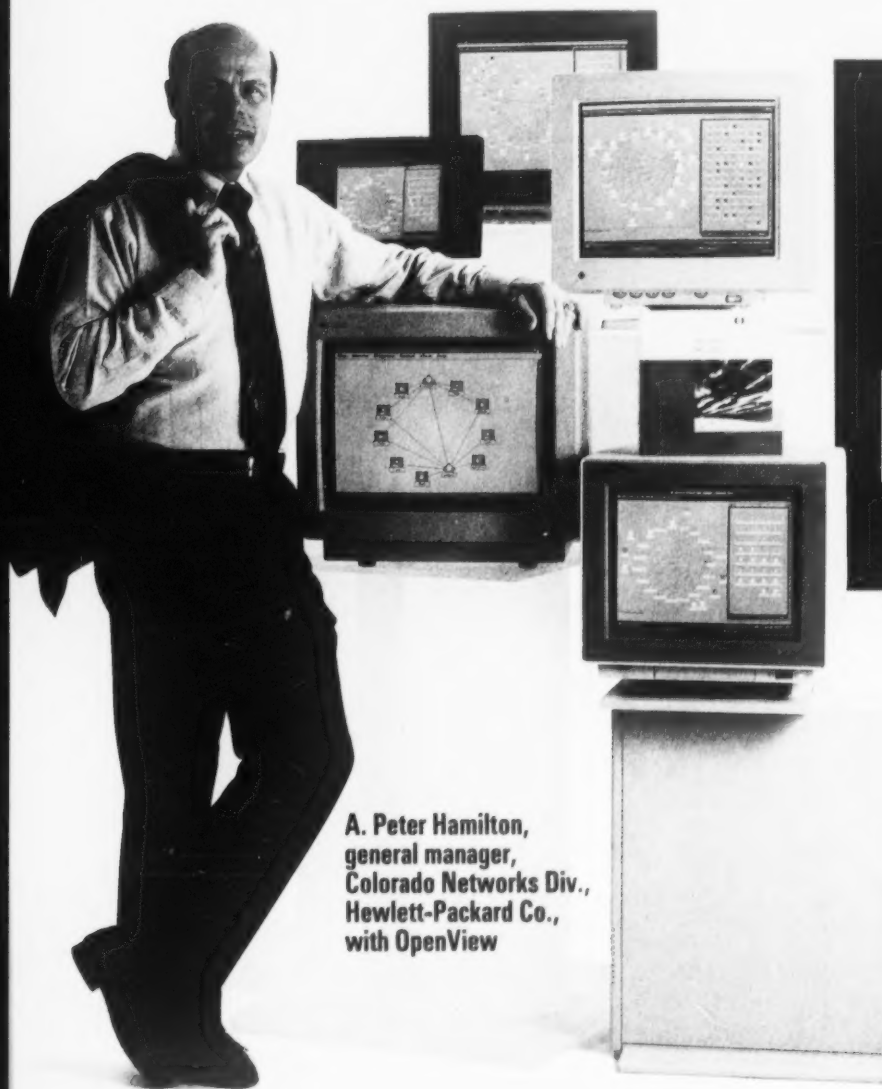
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A. Peter Hamilton,
general manager,
Colorado Networks Div.,
Hewlett-Packard Co.,
with OpenView



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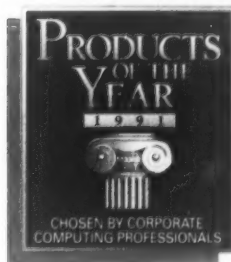
22 HP Opens Up Network Management

On a clear day, you can see to the end of your network with OpenView, even if it's a multivendor, multiprotocol net.



ON THE COVER: HP's Hamilton has OpenView for a multitude of platforms; HP, IBM, Sun and Toshiba.

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30 DATAMATION's 1991 Products Of The Year Contest Winners

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78 Easy Database Access

Personal Access, Spinnaker Software Corp.'s new database access and application development tool, could be the answer to time-consuming, complex and costly data access problems.



Alpha's cochairmen Richard (r.) and Selwyn Rabins have built a database that's powerful and easy to use, page 77.

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79 Does Your DBMS Do Windows?

If you're migrating to Windows and all you lack is a DBMS, you may not have long to wait or far to look.

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43 Cutting Through The 486 Confusion

The 486 chip comes with enough models and prices to confound any PC buyer. Here's your guidebook to help steer through the commotion.

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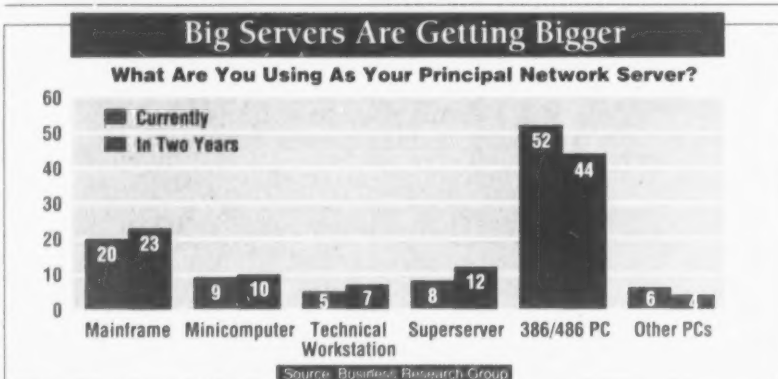
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Serve 'Em Up, Serve 'Em Big

As corporate MIS shops put more of their critical commercial applications on local area networks, their demand for high-powered server hardware is fast increasing. New data from a recent survey by the Business Research Group even show that mainframe systems may be reemerging as a strong basis for servers on many larger networks. At the same time, all of these LAN-based systems still need to access data residing on legacy mainframe and minicomputer systems.

According to the recently completed survey of 300 *Fortune* 1,000 and smaller companies that have implemented or plan to implement client/server systems, a three-tier computing environment is emerging for servers used in client/server computing—big, really big and gigantic. Currently, the leading server platforms for networked systems regardless of operating system are 386- and 486-based personal computers. They are named as the primary server for client/server net-



works by 52% of respondents. The next most popular primary server platforms are mainframes (20%), with minicomputers coming in a distant third at 9%. However, two years from now, fewer respondents' (44%) expect to be using 386 and 486-based systems as their primary server and more expect to be using mainframes (23%), minis (10%), technical workstations (7%) and superservers (12%) in that role.

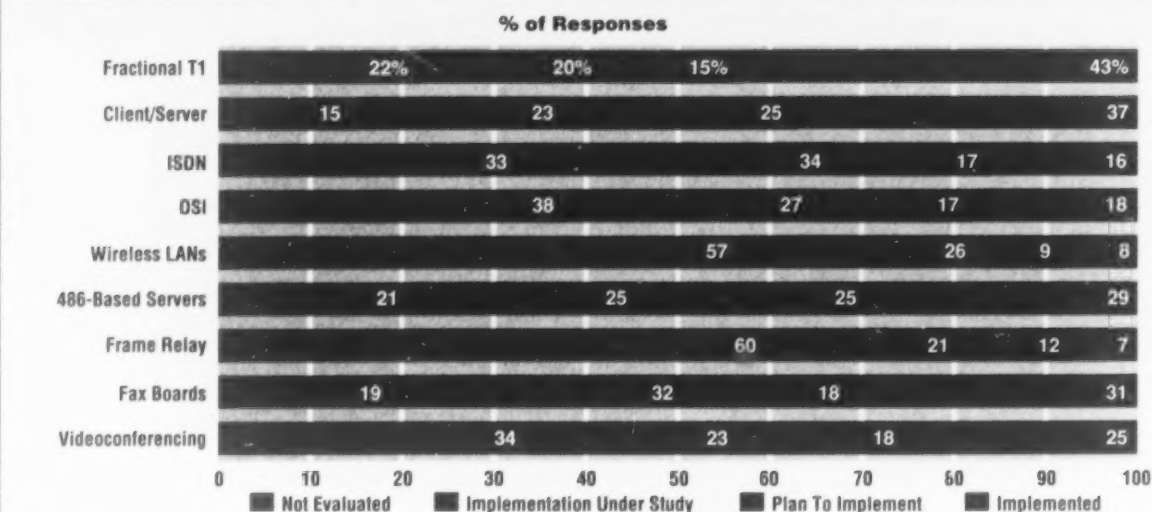
The survey also shows that most sites continue to rely on their mainframe systems to process applications like accounts payable/receivable, payroll, inventory and reports as well as to

store the data generated by these applications.

Nearly three-quarters of the respondents say they strongly agree that direct user access to mainframe and mini data will continue to be an important goal. Only 7% disagree at all with that statement.

Warren Childs and Kathryn A. Tito, Business Research Group. For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02458.

DATAMATION's Technology Implementation Index: Networks/Communications



DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

MARCH 1, 1992

Kevin Burns,
chairman and CEO,
Intersolv Inc.,
with Excelerator II,
CASE tool

Can Intersolv Excelerate On OS/2?

page 24

In This Issue:
A Special Focus On CASE:

*Open CASE Emerges
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24 Can Intersolv Excelerate On OS/2?

Intersolv is readying its Excelerator II analysis and design CASE tool for shipment to customers this month, almost two years after development began. Can Intersolv make up for lost time—and lost customers?

SPECIAL REPORT

30 Open CASE Emerges As AD/Cycle Lags

IBM promised AD/Cycle would create an open CASE development platform. But not a single CASE tool can yet talk directly to IBM's Repository Manager. Now, CASE vendors are starting to employ independent CASE standards.

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73 New Windows Tougher To Break

Next month, Microsoft Corp. is expected to ship Windows 3.1. Aside from a few cosmetic niceties, the changes are mostly under the hood—right where most IS managers thought they were needed.

74 Organize Your E-MailBag

Folio Corp.'s Mailbag compresses e-mail to half its original size.

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75 A World Of CASE Tools

Looking for a CASE tool? Check out over 400 products from over 100 vendors.



ON THE COVER: Intersolv's Burns hopes Excelerator II can speed away from the pack.



Microsoft's Rich Tong: The whole purpose of Windows is to make PCs easier to use, page 73.

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43 A Window Into CASE

One of the CASE industry's most affordable offerings also happens to be among the first with true Windows support.



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True client/server CASE support remains a distant dream, but it is coming.

BC Gas's Young has reduced his mainframe-processing needs by at least 40%.

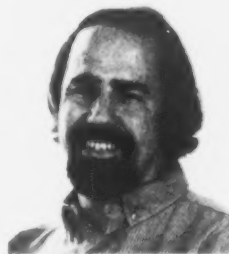
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59 Database Vendors Make Their CASE

At long last, relational database programmers can tap into the world of CASE.

63 Bridging The CASE/OOP Gap

Object-oriented programmers finally have a CASE of their own.



Rational's Booch has a method to his madness.

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67 Safe Deposit For Enterprise Data

By providing a central store for a comprehensive enterprise model, repositories aim to deliver on the promise of integrated CASE.

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RESEARCH

TECHNOLOGY TRENDS

Ringing Up Better Voice Response

MIS managers who never dreamed they would be managing telecommunications systems are now in the middle of it all, as they begin to implement interactive voice response systems for their companies. Voice-computer communications systems are becoming increasingly popular among companies with large amounts of customer service phone traffic.

In the latest poll of DATAMATION's Technology Panel, more than a quarter (28%) of respondents say their companies have implemented an interactive voice response system. In the majority of cases, these systems use an automated synthesized voice to direct callers to input information via their Touch-Tone phone. The system then directs the call to a specific person in the company or grants access to specific account information.

Such systems can greatly improve customer service and responsiveness with no increase—and occasionally some decrease—in personnel. Banks,

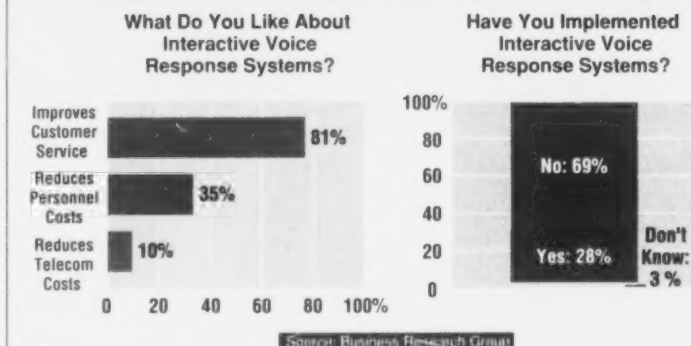
life insurance companies and brokerage firms are good examples of the most efficient and effective users of these systems. They're often used in such enterprises to provide customers with 24-hour access to routine information previously provided by customer service agents. By automating these information response systems with interactive voice response, these companies are able to free up professional staff to spend more time on more complex inquiries.

A significant percentage (35%) of our panel members cite this savings in per-

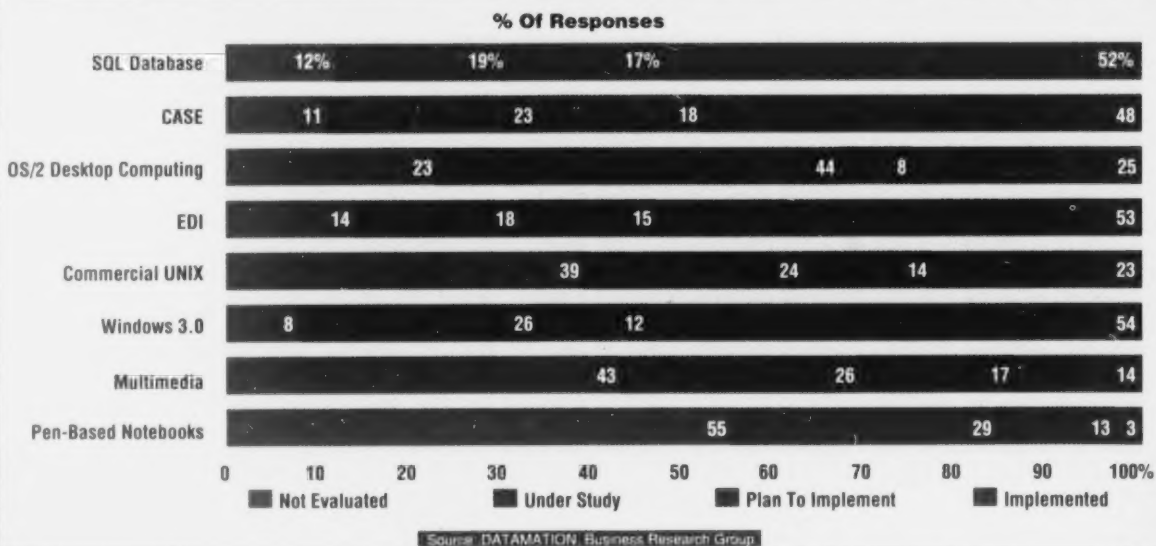
sonnel costs as a major benefit they expect to receive from implementing interactive voice systems. But by far the greater number—more than 80%, in fact—expect their companies to benefit from the systems through improved customer service.

By Warren Childs and Kathryn A. Tito, Business Research Group. For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

Less Talk, Faster Response



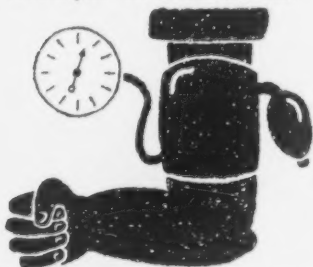
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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

MARCH 15, 1992

Dennis McEvoy (l.), CEO,
and Kim Worsencroft,
VP of R&D,
Cooperative Solutions Inc.,
with Ellipse



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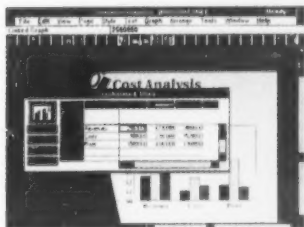
FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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Cooperative Solutions has client/server OLTP software that promises big-box security and integrity. But is Ellipse ready for a heavyweight bout?



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Windows 3.1 users can now edit compound documents with every element in place, including graphs, tables, charts and spreadsheets.

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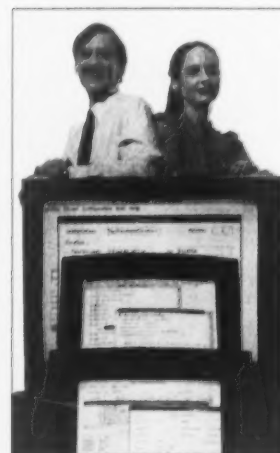
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78 New Uses For Optical Storage

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ON THE COVER: Cooperative Solutions's McEvoy (l.) and Worsencroft bring OLTP to your desktop.



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Every day, portable PC users walk out the door with many megabytes of your company's data. What steps are you taking to secure it?

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How vendors are making it possible for you to upgrade and maintain your routers and bridges in Perth as if they were just down the hall.

52 When Superservers Are The Best Bet

Large LAN facility servers are more efficient, less costly and require fewer administrators than multiple, smaller work group servers.



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Downsized software for product distribution saves time and money. But vendors—and users—are in no rush to get down and distributed.

Integral's Snyder sees downsizing's future.

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WAN Maintenance Without House Calls

How vendors are making it possible for you to upgrade and maintain your routers and bridges in Perth as if they were just down the hall.

You want to upgrade your bridges and routers with frame relay capability, but there's no one in your Perth, Australia, office who's really up to installing the new software and reconfiguring the hardware. Then you find out that there's something wrong with that internetworking box out in your five-person branch office in Hungary. No one there has a prayer of being able to look under the covers and diagnose the problem, and your vendor only offers limited service on the ground. You just looked at your budget an hour ago, and there's definitely no money to send a technician out from your Chicago headquarters on the next plane.

That's when you might wish you could trade in your travel agent for bridges and routers with remote upgrade, diagnostic and configuration capabilities. If you had such devices, you might be saved the costs of sending someone out to fix problems or update software. You might be saved the expense of a pricey full-time maintenance contract (which may not even be an option outside North America, Western Europe and Japan). Even if you couldn't actually fix every problem, at the least you'd know what the problem is when one comes up.

And simply knowing that can save not only money but downtime by reducing the mean time to repair. David Schroeder, manager of service with vendor Vitalink Communications Corp. explains: "Certain network anomalies that appear are not identified immediately to a specific piece of hardware. You may need to take a look at multiple nodes from the one location. That's where the remote diagnostics really helps reduce the mean time to repair."

BY TOM McCUSKER

With diagnostic software resident at each node, the network owner can not only employ an on-site operational technician to look at the problem but also, with remote diagnostic capability, call on the vendor to help solve the prob-

lem. Thus you can bring in experts from other locations to look over your shoulder as you're diagnosing a problem. In addition, a lower level of technical expertise can be used at the remote location while higher level technical people at the central site can dial in and do reconfiguration work.

What Support To Expect For Remote Bridges, Routers

Here's a checklist of features to start with when selecting routers and bridges, together with the percentage of vendors supplying such features (according to a DATAMATION survey in January of 100 vendors.)

What The Bridges And Routers Should Do:

Offer SNMP or other standards-based management	77%*
Offer remote diagnostic capabilities	87%
Be able to be remotely configured	84%
Include diagnostic software resident at each node	87%
Provide dial backup access capability	54%
Allow software upgrades to be done remotely	64%

* % of respondents offering products with these capabilities

Service Options

Direct on-site service: 70% On-site service via a third party: 46%
Level Of Service Offered**



Less than
four hours: 33%

MON

One-day
service: 36%

JAN
FEB
MAR

More than
one day: 10%

**Service levels are generally negotiated with clients, who are usually charged according to the level of service agreed upon.

Where Direct Service Is Available

% of Vendors Offering Direct Support And Service (By Region)

North America	90%	Southeast Asia	16%
Western Europe	46%	South America	13%
Far East	30%	Middle East	13%
Eastern Europe	26%	Australia	11%



Source: DATAMATION

Considering the potential advantages, it's not surprising that remote capabilities, partially driven by the adoption of network management based on standards such as the Simple Network Management Protocol (SNMP), are showing up on more and more devices.

But buyers should be aware that the advantages could be just that—unrealized potential. Comprehensive remote capabilities in bridges and routers are far from universal, and not all of the features in various vendors' products work in a consistent fashion.

For example, DATAMATION has found in a study of about 100 vendors that more than a third don't provide anything that allows you to upgrade software remotely. Almost a quarter sell bridges and routers that don't include a management system based on any standard, such as SNMP.

"SNMP is becoming a must for doing business in an internetworking environment that emphasizes standards and interoperability," says Kurt Bauer, director of product marketing at Fremont, Calif.-based Vitalink.

Now that SNMP is becoming more established, vendors are going beyond its basic capabilities. For example, Cisco Systems Inc., of Menlo Park, Calif., has gone beyond plain vanilla SNMP in its router configuration management software with a graphical interface. "First, it [the interface] gives you a nice picture of the network," says Ed Kozel, director of business development. "What is more productive, though, is that you can click on a router, and it [the software] will bring up the configuration, which you can alter at the console and then remotely download to the remote loader." Cisco also uses the same techniques to download new software to the router.

All the software standards in the world won't help you manage remote devices if you don't have a way to reach those devices when your network is down. That requires a dial backup capability, which is nothing more glamorous than having a modem attached to the remote bridge or router so that you can reach it through the public network if your dedicated lines die. "Nine times out of 10, if you've got a failure to a remote site, it's because of a

bad line," says Chuck Berman, senior product manager of internetworking at SynOptics Communications Inc. in Santa Clara. Yet many vendors reported in the DATAMATION survey that they didn't offer a backup dial access capability to remote devices.

Even with dial backup and some level of remote capability, network device reconfiguration, upgrade or maintenance may still result in downtime.

is to download and whether there is an automated network management system that will do it.

Cisco once required that a customer log into its remote router and ask it to get a fresh configuration file from a central repository. Today, you can initiate remote reconfiguration from a centralized Sun workstation. As Kozel explains: "You mouse over to the router on the screen, change the configuration

Connecting With Bridge, Router Vendors

For more information on the remote capabilities of bridges and routers, circle the appropriate number on the Reader Card to contact the following device vendors.

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Source: DATAMATION

Cisco's Kozel explains that in many of the products, these changes can't be activated without rebooting the devices. This is serious should you have 100 of them deployed and each has to be rebooted in turn as they are upgraded. "Avoiding the rebooting," Kozel says, "is a very practical and desirable feature that technically isn't hard to provide, but a lot of devices do not support it. Thus you might have anywhere from between one and 10 minutes of outage for that node in the network, depending on which vendor's equipment it is."

Kozel also cautions network administrators to "look deeply" into devices that can receive downloaded data, such as configuration profiles. He suggests that customers examine how difficult it

for the remote router and click on the button that says 'activate,' and it automatically downloads that [new profile]."

SynOptics uses a new chip technology called Flash EEPROM (for electrically erasable read only memory) to download software to routers and bridges. In effect, the new technology enables the software image you transfer to the remote device to be stored forever in nonvolatile random access memory.

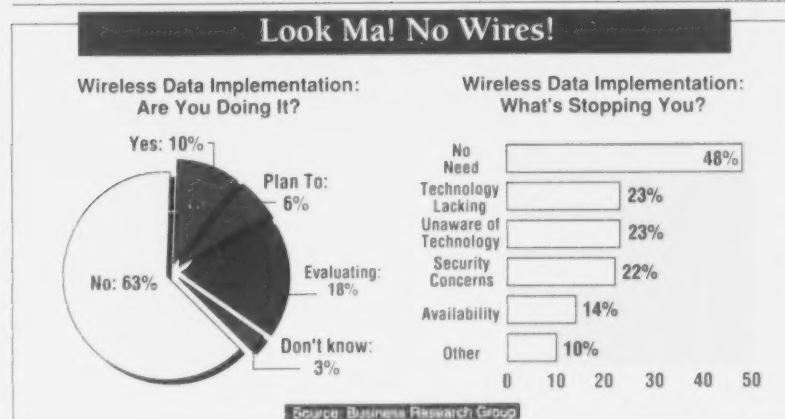
The more your network grows, particularly internationally, the more you'll want to buy internetworking devices that you can maintain from afar. Look closely, because today you have to pick and choose to get the level of support that's right for you. ■

You Can Compute While You Commute

The technologies of the 1980s made it possible to talk on the go, and now technologies of the 1990s are making it possible to compute on the go.

Wireless data communication networks are now publicly available in most major U.S. metropolitan areas. Like cellular telephone networks, these wireless data networks operate using a grid of cells that transfer the radio signal to the public wire networks. The main difference between the two types of networks is that wireless data networks use packet switching while wireless voice networks use circuit switching. Packet-switched wireless data can provide more economical rates than circuit-switched systems because carriers can charge customers by the packets actually sent rather than by the minute.

While still a relatively new service, only 2% of DATAMATION's Technology Panel are unaware of these wireless



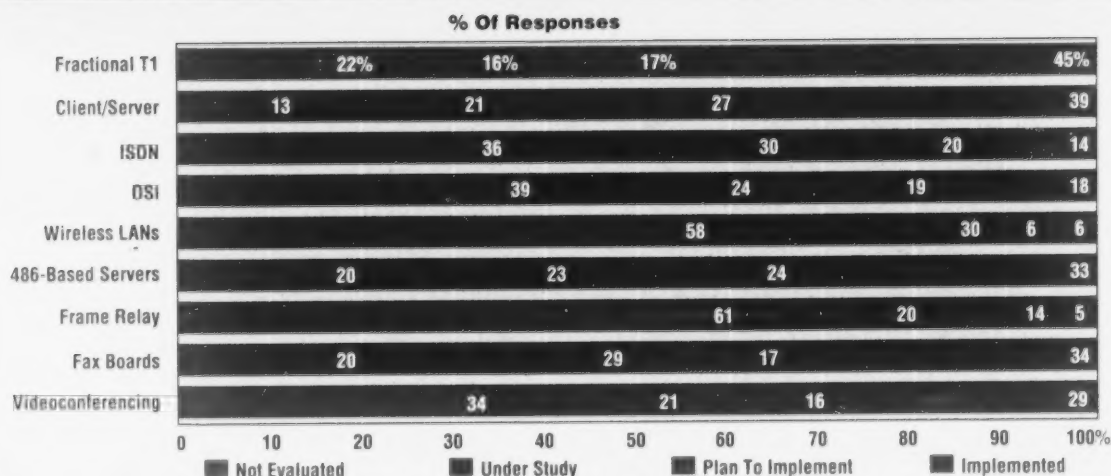
data communication systems. Indeed, 10% of panel members say that their companies are using wireless data communications—although some of this may be for private networks or may be in the form of a specialized mobile radio network. About a quarter of panel members report their company either plans to use or is now evaluating a wireless data network.

The biggest obstacle cited by panel members to the use of wireless data networks is the lack of need for it. But

many laptop computer makers now offer wireless data communication capabilities, and the growing use of laptops in the workplace may boost use of wireless data networks as a result.

Warren Childs and Kathryn A. Tito, Business Research Group. For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

DATAMATION's Technology Implementation Index: Networks/Communications



DATAMATION each month surveys a select group of its readers--the DATAMATION Technology Panel--to investigate the implementation of new technologies by key user organizations.

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Domenic LaCava,
VP of UNIX software
and systems group,
Digital Equipment Corp.,
with the Personal DECstation

APRIL 1, 1992

SPECIAL THREE-PART FEATURE

Workstations: Digital Plays Its ACE

page 28

**Workstations:
Digital's Competition**
page 34

**Workstations:
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28 Workstations: Digital Plays Its ACE

They're cheap, ACE compatible and fully upgradable. So why is Digital's gamble that users will flock to the new Personal DECstations still no sure bet?



ON THE COVER: Digital's LaCava is playing the expansion possibilities to the hilt, page 28.

PCs & WORKSTATIONS



34 Workstations: Digital's Competition

This year, it doesn't take a lot of money to buy a lot of workstation.

40 Workstations: Choosing An ACE OS

ACE supports two flavors of UNIX, and Microsoft Windows NT. Which, if any, will dominate?

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81 Excel 4.0 Ups Spreadsheet Ante

Excel 4.0 is Microsoft's answer to user requests for an easier to use, more flexible spreadsheet to rival Lotus 1-2-3.

82 AGS Upgrades Project Pack

Project managers who want to distribute computer resources may want to take a look at Wings II/PC, a recently released upgrade of AGS Management Systems Inc.

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83 The Portable 4GL?

When it comes to fourth-generation languages, portability is the key—just stick a handle on your tools and go.



PRODUCT GUIDE: Microsoft's Levin has raised the spreadsheet stakes, page 81.

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47 The OverLAN Route To AS/400s

In the next two years, IS managers will have to choose between different LAN options to connect some 4 million PCs to AS/400s.

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54 What's Holding Back Distributed Computing?

Most vendors are quick to claim they have an architecture that will let you build distributed-computing systems. But *open* distributed computing? That's still on the drawing board.



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61 Idiot-Proof Your SQL Queries

New end-user database query tools give even the most computer-illiterate users an easy way to look into complex corporate databases.

64 Yup—Now OS/2 Runs Windows 3.0 In A Window

IBM's full release version 2.0 of OS/2 seamlessly runs Microsoft's Windows in the multitasking, multithreaded world of the OS/2 desktop.



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71 Bar Codes Break Out

Once you learn what bar codes do today, you may find uses you never thought of before.

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75 IBM's AS/400 Grows Up

Mainframe users are looking anew at the AS/400. And for good reason: the application-rich AS/400 now rivals mainframes in performance.

INTERNATIONAL: Special supplement, not included in all issues, page 80-1.

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How Bad Was IT Last Year?

Like the rest of U.S. manufacturing, information systems producers suffered through a painful year in 1991.

The DATAMATION Information Systems Performance Indicator (ISPI) ended last year at a low 94.84, exactly where it had started in January 1991. Overall shipments of information systems grew by just 1.0% in 1991—the weakest annual gain since the 1986 decline. But even though growth of shipments slowed, purchases of computers by the business sector started to head up more firmly late last year. This slow but steady increase in demand will help push the ISPI past the growth-indicating 100 mark by this summer and boost it to 106 by year's end.

What's more, a rising portion of production over the next two years will head straight out the door instead of into inventory. During 1984, monthly inventory averaged \$18.34 billion, a surge of 17% from the year before, and average inventory-to-shipments (I/S) ratios hovered in the 2.5 to 2.7 range (meaning for every item shipped, 2.7 of them were sitting in a warehouse).

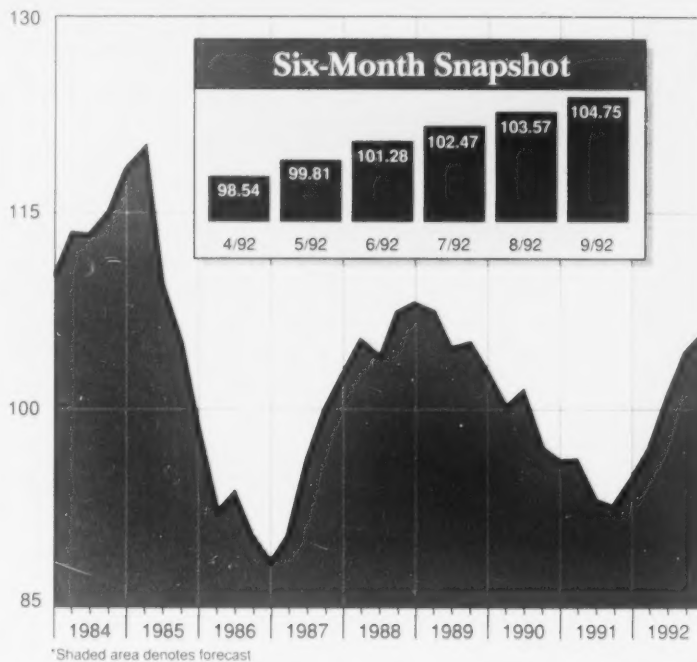
But since those heady days, IS manufacturers have been slashing inventory levels as a matter of policy. In 1991, monthly information equipment inventory averaged only \$15.7 billion, and the I/S ratio stood at 1.58—the lowest ratio ever recorded.

We expect information systems manufacturers, in an effort to keep inventory levels in check, will continue to hold back production growth. However, with output turning more quickly into sales, the industry should find itself in financially healthier shape. ■

By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617)-630-2105, send him a fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington Street, Newton, MA 02158.

The IS Performance Indicator

The Roller Coaster Continues



*Shaded area denotes forecast

	Dec. 1991	Nov. 1991	% Change 12/91-11/91	Dec. 1990	% Change 1990/1991
■ Information-Processing Equipment					
Shipments (SA, \$ billions)	9.57	10.25	-6.6	9.45	1.2
New Orders (SA, \$ billions)	9.52	9.52	0.0	10.02	-5.0
Unfilled Orders (SA, \$ billions)	25.70	25.75	-0.2	28.91	-11.1
Inventory (SA, \$ billions)	15.09	15.37	-1.8	15.86	-4.8
■ Computer Production Workers					
Employment (NSA, thousands)	255.4	256.2	-0.3	274.6	-7.0
Average Weekly Hours (monthly avg.)	42.9	42.1	1.9	43.4	-1.2
■ Stock Index					
S&P's Computer Systems Stock Price Index	161.2	147.8	9.0	180.8	-10.9
■ Contracts & Orders					
New Plant & Equipment (SA, \$ billions)	37.9	34.9	8.5	36.5	3.8

SA= seasonally adjusted.
NSA= not seasonally adjusted

Source: U.S. Commerce Dept., Standard & Poor's forecasts, Cahners Economics

Source: Cahners Economics

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John Kish,
VP of desktop products
Oracle Corp.,
with Oracle's Server For NetWare

APRIL 15, 1992

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28 Oracle's DBMS Engine For NetWare

This month marks the release of the second version of Oracle's Server For NetWare, the first full-bore SQL relational database for NetWare, whose mission is to bring errant LAN data under control.



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The Object Management Group promises enterprisewide, interoperable bliss through object technology. But you'll have to wait a while.

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87 Phone + Computer = Application

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88 CUA For xBase Development

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90 A Window Into Document Management

Windows-based document management systems don't just keep track of documents, they can change the way you work—for the better.



ON THE COVER: Oracle's Kish has his hands on an RDBMS that flies, page 28.



PRODUCT GUIDE: Open + Voice Inc.'s Masterson is on call, home or away, page 87.

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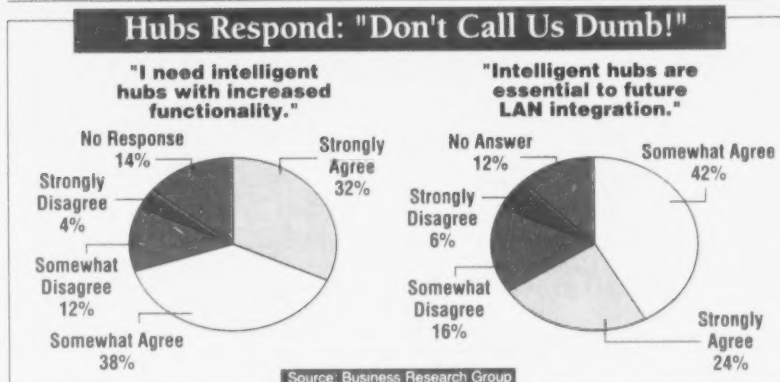
RESEARCH

TECHNOLOGY TRENDS

Wiring Hubs Smarten Up

These days, network managers want their wiring hubs to do a whole lot more than just sit there and look important; they want hubs that are smart enough to help manage multivendor environments. In the latest survey of DATAMATION's Technology Panel, nearly two-thirds of panel members agree with the statement: "intelligent hubs will play an integral role in our efforts to integrate local area networks."

Wiring hubs are no longer just simple tools with which to organize network wiring; they're now capable of playing a central role in integrated network management. Vendors are responding to users' needs to accommodate multiple types of cabling, such as coaxial, fiber optic and twisted pair, by offering "intelligent," or "smart," hubs. These have advanced network management, bridging, routing and port monitoring capabilities for remote network configuration.



Eighteen percent of panel members have already implemented smart hubs, 10% have definite plans to implement them and 19% have begun to evaluate the role of the smart hub in their LAN integration plans.

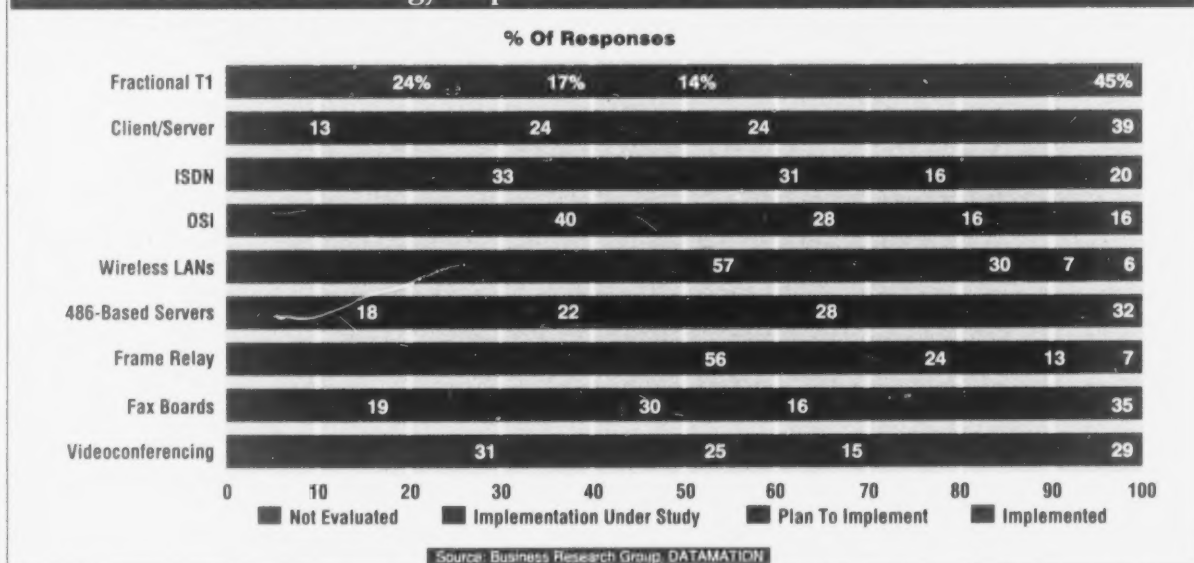
Vendors increasingly are putting more security and failsafe features into their intelligent hubs. For example, many of today's newer models incorporate redundant modules to bring a measure of fault tolerance to the network.

The market for intelligent hubs is expected to reach \$750 million this year. Market leaders include Ca-

bletron Systems Inc. in Rochester, N.H.; Chipcom Corp. in Southborough, Mass.; and three Santa Clara firms—SynOptics Communications Inc., 3Com Corp. and Ungermann-Bass Inc.

Warren Childs and Kathryn A. Tito, Business Research Group. For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

DATAMATION's Technology Implementation Index: Networks/Communications



DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

RESEARCH

ECONOMIC TRENDS

From Gotcha! To Hot Cha Cha!

Remember the hopes for economic recovery last year? A nascent manufacturing recovery began in the middle of 1990 and, hopes were, it would turn into a strong rebound in 1991. But then the Gulf War came along, and the recovery fizzled out.

Now the signs of an incipient recovery are once again sprouting, but this time it looks like the real thing. Since early last winter, in fact, manufacturing has given off weak but steady signals that a recovery is slowly forming and that business confidence is finally returning after a sporadic period in and out of the doldrums.

According to Cahners Economics's monthly surveys of the level of U.S. business confidence, the confidence index for the manufacturing sector rose steadily from 61.9 in July 1991 to 65.5 in October, but then dropped in November and December, hitting a low of 57.4.

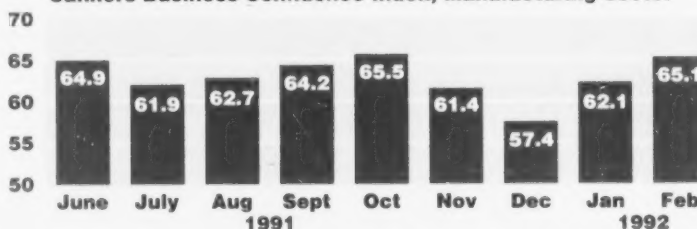
Cahners Economics expects that by the second half of this year low interest rates combined with pent-up demand, relatively high capacity utilization rates and low inventories will once more inspire business spending.

Business confidence is already giving an inkling of the recovery's arrival. Cahners Economics's Business Confidence Index for the manufacturing sector rose strongly in January to 62.1; the December 1991 figure was 57.4. The index jumped again in February to 65.1, which means that more companies are expecting increases in sales and capital spending. So, look for improved growth in your information systems budgets later in 1992 and 1993.

Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617)-630-2105, send him a fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington Street, Newton, MA 02458.

Here Comes Mister FeelGood Again

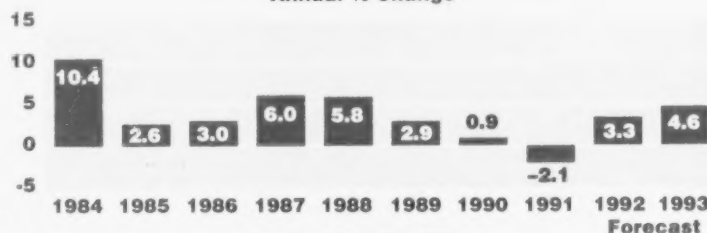
Cahners Business Confidence Index, Manufacturing Sector



Note: Cahners Business Confidence Index is calculated by summing the share of responses indicating increases plus one-half responses indicating unchanged over the next three months.

Source: Cahners Economics

**Manufacturing Industrial Production
Annual % Change**



Source: Federal Reserve Board
Forecasts: Cahners Economics

The Economy At A Glance

U.S. Economy: Macroeconomic And Industrial Indicators

	Actual		Forecast (Annual % Change)		
	Q3 91	Q4 91	1991	1992	1993
Gross National Product	1.8	0.3	-0.7	2.0	3.2
Business Investment In Equipment	6.7	0.6	-3.2	2.9	4.0
Government Spending	-3.4	-5.9	0.8	-2.5	2.4
Consumer Spending	2.3	-1.1	-0.2	1.8	2.9
Exports	7.3	15.4	6.7	7.0	3.8
Imports	22.3	-2.0	0.0	4.6	2.4

All calculations are % change in 1987 dollars; quarterly figures are seasonally adjusted annual rates

	Dec. 1991	Nov. 1991	% Change 12/91-11/91	Dec. 1990	% Change 1991-1990
Manufacturing Production (1)					
Process Industries Total	108.2	107.8	0.3	106.7	1.4
Chemicals	113.7	113.0	0.6	109.9	3.5
Petroleum	107.2	106.7	0.5	105.6	1.5
OEM Total	109.2	110.0	-0.7	109.0	0.2
Computers & Peripherals	159.3	158.5	0.5	148.9	7.0
Communications Equipment	112.9	112.4	0.4	108.9	3.7
Transportation Equipment	97.9	99.7	-1.8	96.6	1.3
Services Employment (2)					
Finance, Insurance, Real Estate	6.675	6.673	0.0	6.714	-0.6
Health Care	8.431	8.390	0.5	8.026	5.1
Computer & Data Processing	0.859	0.853	0.6	0.805	6.7
Transportation/Utilities	5.853	5.864	-0.2	5.917	-1.1
Retail Trade	19.811	19.554	1.3	20.182	-1.8
Wholesale Trade	6.029	6.050	-0.3	6.172	-2.3
Government	18.818	18.870	-0.3	18.653	0.9

(1) Index 1978=100, seasonally adjusted

(2) Millions of persons, not seasonally adjusted

Source: Commerce Dept. and Cahners Economics

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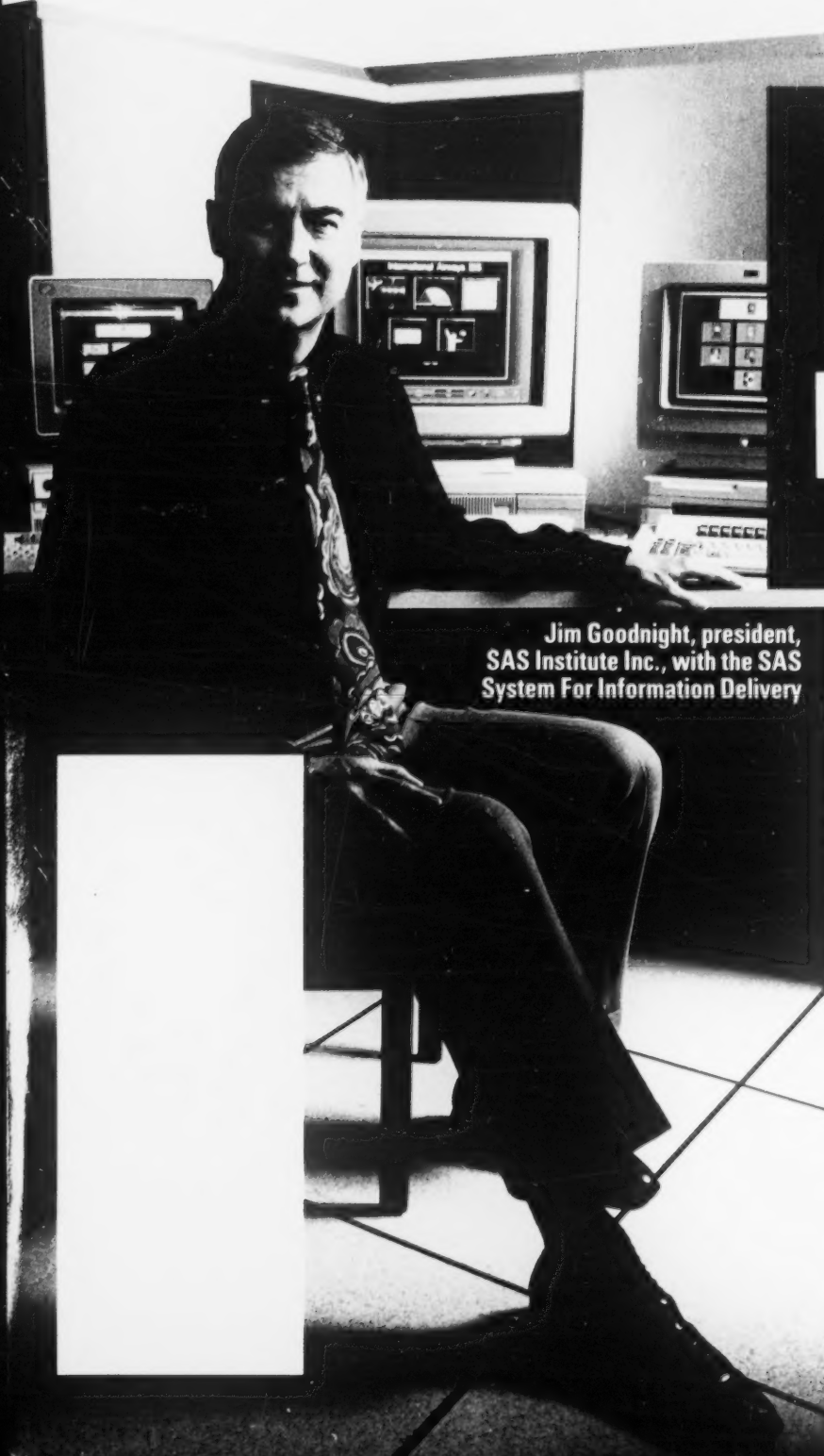
DATA MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

MAY 1, 1992

Can SAS Serve The Enterprise?

page 28



**Jim Goodnight, president,
SAS Institute Inc., with the SAS
System For Information Delivery**

The Feud Over Windows Families

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One Last Chance For ISDN

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**THE HOT
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OF 1992**

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COVER STORY

28 Can SAS Serve The Enterprise?

SAS has already transformed itself into the software system of choice for hordes of MIS shops. Will the new cooperative-processing version 6.07 convert hordes more?



ON THE COVER: SAS's Goodnight displays the SAS System on a variety of platforms, page 28.



EXCLUSIVE

34 The Hot Applications Of 1992

Improve operations, improve process, improve efficiency. Networks and related technologies are the tools IS will use, reveals DATAMATION's Budget and Spending Study.

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91 Go Figure With A Pen

By the end of this month, Slate Corp. expects to roll out At-Hand, a pen-based spreadsheet that runs under Go Corp.'s PenPoint operating system.



PRODUCT GUIDE: Slate's Underkoffler throws away the keyboard, page 91.

92 A Kinder, Faster Fax/Modem

Intel Corp. has introduced a line of internal fax/modems that mesh the hardware, special software and a new architecture.

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94 OS/2 Development Tools, Take 2.0

If you want to develop multithreading, multitasking applications with OS/2 version 2.0, you won't have long to wait.



PCs & WORKSTATIONS: Get it all with one shot, page 57.

PCs & WORKSTATIONS

57 The Feud Over Windows Families

Microsoft has one. So does Lotus. But is buying into a company's Windows family always a good bet?

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After years of hyperbole and delay, ISDN is back with a much more realistic agenda.

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71 Industrial Strength UNIX Management Tools

UNIX's one major failing in big data centers: loosey goosey systems controls. But now that's all changing.

77 How To Avoid The Pitfalls Of Downsizing

Forget the utopian hype. Downsizing from mainframes to workstations is a tough job. But these basic principles can make it work.

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82 What's It All About, Alpha?

Digital is courting VMS users with tantalizing glimpses of Alpha, its upcoming 64-bit RISC family. But will Digital move fast enough to reclaim wavering users?

Catholic University's Hassler looks forward to Alpha as the next migration path.

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108 CASE Use Is Growing, But In Surprising Ways

Most mature IS organizations still just use CASE tools to help with administrative dirty work and not for full-blown application design.

INTERNATIONAL: Special supplement, not included in all issues, page 88-5.

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RETAIL TRANSACTION

Improve operations, improve process, improve efficiency. Networks and related technologies are the tools IS will use, reveals DATAMATION's Budget and Spending Study.

The Hot Applications Of 1992

The most prized application of information technology in 1992 isn't some whiz-bang knowledge-based trading system that outscores Wall Street wizards or a lightning fast COBOL code generator or a breath-taking voice-recognition program. Instead, this year's blue ribbon for the best in technology investments will be wrapped around something

a little less glamorous. The still chilly economic climate—brought on by the lingering effects of the recession, sharply declining armaments spending by the Department of Defense and heightened global competition—has forced IS managers and their supervisors to focus their technology spending more tightly on projects that will reduce their organizations' overall costs.

Technologies and products that better manage existing hardware, software and networks, ordered by many veteran IS leaders who remember how to successfully bring order out of computing chaos, are the top development and spending priorities this year. "Networks have become a major bottleneck in our bank," concludes one head of IS. Incompatible networks developed by once independent business units plague the corporate-computing landscape, and IS managers have been given the chore of cleaning up the mess. "We are an organization in transition, from

a relatively dispersed and distributed transaction-oriented system to a more integrated, client/server model," adds Michael Simmons, executive vice president for operations and systems at The First National Bank of Boston Corp.

As IS managers try to bring order to the undisciplined departmental systems cobbled together in the late 1980s, they will do so with only a modest increase in resources. This year's budget study shows a 4.0% average budget increase, up only six-tenths of a percentage point from last year. But the survey reveals a broad range of spending across various sectors. Health care institutions will increase spending by 8.6% this year, and retailing is up by 6.1%. IS budget

increases for financial services firms, transportation companies, government IS departments and other sectors will barely cover the expected 3% inflation rate, if that. Indeed, many IS shops report budget cuts this year or at best expect that

The Most Popular Applications In 1992

LAN Management	30%*
Electronic Mail	27
Office Automation	24
Records Management	23
Financial Reporting	22

*The % of respondents reporting the use of each application at their sites.

Source: DATAMATION/BRG

BY LARRY MARION

EXCLUSIVE BUDGET SPENDING SURVEY

spending will remain at 1991's level. "Our 1991 to 1992 budget is flat, after the budget had declined by 17% from 1990 to 1991," says Bank of Boston's Simmons.

To determine how IS departments are coping under the unprecedented economic pressures, DATAMATION and the Business Research Group (BRG), a sister organization of the magazine also based in Newton, Mass., late last year contacted more than 17,000 managers in a landmark study of U.S. organizations' 1992 IS budgets and application-development plans. More than 1,700 returned detailed questionnaires. In addition, about 100 IS managers interpreted and explained the data under condition that their identities not be revealed. This is DATAMATION's first survey of the applications development plans and decisions of a large number of sites on a sector-by-sector basis. (Detailed reports on 10 key sectors begin on page 40.)

Cost management was a very important or the most critical goal of more than 90% of survey respondents this year. Less than a third of them said that improving the quality of their companies' products and services was a critical goal of IT in 1992, despite all the media hype about the new devotion to quality. "The whole goal of the company is to survive," says the IS chief at a company dependent on weapons contracts from the DoD. "So the IS budget is down 10%. We're just treading water."

The key IS life-preserving strategy for keeping corporations, government agencies, hospitals and other organizations afloat in 1992 is to get better control of and more computing efficiency from existing networks through network management, client/server and e-mail applications.

Overall spending on networking products is up more than 5% this year from last, a higher growth rate than for other budget categories such as hardware (4.4%) or software (4.2%). About 46% of the respondents said that they are working with LANs this year, the highest percentage for any

one technology; 43% of all respondents are incorporating a client/server architecture on the LAN. The growth in the number and size of LANs beginning in the late 1980s has enabled many organizations to take advantage of these networks to downsize applications from mainframes to PC servers, IS managers say.

"The client/server architecture will be used for new applications plus for rehosting existing corporate apps as a strategy to reduce IS costs," says the head of MIS for an aerospace company. Replacing a remote data center with a LAN-based client/server system has an important political as well as cost bene-

fit—departments facing the prospect of losing their data center can be placated by the physical presence of the server. "Divisions and sectors that lost data centers through consolidation will be expanding client/server installations in a desire to retain control," the MIS head suggests.

Managing a heterogeneous network environment containing multiple LANs and servers is a significant challenge and administration burden for IS, so the push to install LAN management systems is strong. Network administration is the top applications priority of 30% of the IS officials surveyed. Electronic mail is the second most popular application this year, as LANs evolve into a vital utility, the spinal cord of the organization. E-mail can enhance information distribution as organizations move to improve efficiency in the wake of the reduction in the number of middle management layers.

Using computer and communications technologies to reduce the cost of processing an order, writing a business plan, evaluating an insurance claim and other office tasks are also high on the IS project list in 1992. About a quarter of the survey respondents reported that office automation and records management were priority applications this year. In addition, some organizations are reengineering their office workflow processes to increase productivity and quality at the same time they're cutting data-processing costs, a neat trick if they can pull it off. Bank of Boston, for example, is pursuing several projects to consolidate check-processing using imaging, according to Simmons.

Electronic data interchange is one of those antipaper applications that lots of companies have talked about but relatively few have chosen to adopt—until recently. The need to cut the cost of handling purchase orders, invoices and other business documents, reduce time to market and better match customer demand to supply have created a critical mass of EDI proponents in key industries like consumer products and retailing. About 24% of the respondents said they will develop EDI systems this year, including about

The Most Popular Technologies In 1992

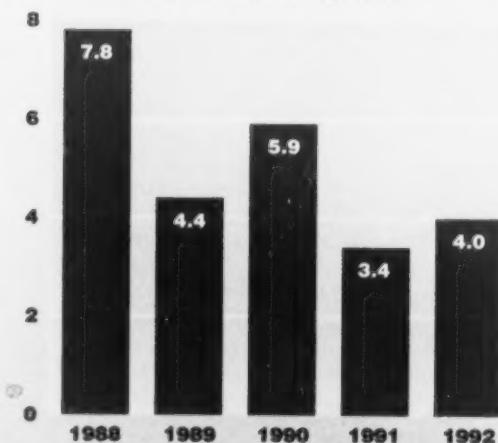
Local Area Networks	46%*
Client/Server Architecture	43
GUIs/Windowing	37
Bar Code Processing	35
Relational Databases	33

*The % of respondents reporting use of each technology at their sites

Source: DATAMATION/BRG

Lean Times For IS Budgets

% Annual Increase In Spending For Information Systems



Source: DATAMATION BRG

half of the retail and wholesale companies and their food, clothing and beverage suppliers.

In fact, the importance of technology for retailers engaged in their perennial struggle for market share is clearly seen in this year's 6.1% spending increase in this sector. EDI, advanced point of sale (POS) systems and other technologies are seen as crucial to the continued financial well-being of retailers and wholesalers. The IS budget at Pier 1 Imports in Fort Worth, for example, is up 20% this year, in part due to a new POS system, says data center director Robert O'Neill.

"Customers like Wal-Mart are a lot more sophisticated, and the importance of technology is much more so now than it was five years ago. And it will be even more important in five years," adds Lewis Duberman, vice president and chief financial officer of Chicago-based cosmetics maker Helene Curtis Inc., which has upgraded its EDI capabilities at the behest of customers. "If a company doesn't invest in technology, it will fall by the wayside," Duberman asserts.

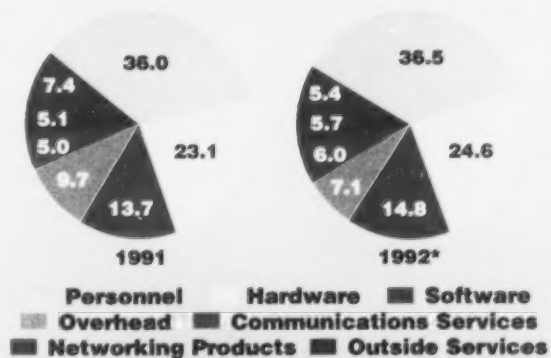
Applications like EDI, office automation and records management depend on specific enabling technologies. And of those technologies, only proven hardware and software will be in demand this year, not bleeding edge, blue-sky dreams. A high priority among the enabling technologies are software and supporting hardware to provide a graphical user interface and windowing capability to make PCs, workstations and advanced terminals easier to use. About 37% of the respondents will be buying GUI software this year, many probably anticipating the revised version of Windows from Microsoft.

While a snazzy GUI looks inviting, users won't have much interest in it if the data they need are not accessible. Relational database management software is crucial for organizations needing to glean the most insight from the data housed in mainframes and network servers, and about 33% of the survey respondents are implementing a new or enhanced RDBMS in 1992. Governments at the local state and federal level will be among the big advocates of RDBMS technology this year—43% of the government offices said that the technology is on their project list for 1992. Some government IS officials say their RDBMS development work this year will focus on consolidating applications on fewer software platforms. Others say they will use RDBMSs to upgrade existing flat file systems or for entirely new applications. One new federal application is designed to keep better track of the government's real estate holdings from failed banks.

Increased use of database and decision-support software has triggered demand for optical disc storage and image-processing systems. About 23% of the respondents indicated that their sites would install an optical disc system this year. Hospitals and medical centers are especially keen on optical storage of patient records—31% of the medical IS managers indicated

Hardware Gets A Bigger Slice Of The IS Budget Pie

IS Budget Allocation (by %)



* Figures do not add up to 100% due to rounding

Source: DATAMATION/BRG

they would develop such an application this year.

Just like last year, IS shops had difficulties preparing a budget to fund these applications in the weak 1992 economic climate. Survey respondents indicated that about 45% of IS departments had to rebudget in 1991, and the same percentage predicts a return to their spreadsheets in 1992. Pier 1's O'Neill says he had to rebudget twice in 1991, and by early March had already done two budgets for 1992. Uncertainty about the economy or other business issues delayed 1992 IS budget approvals at about half the shops until December 1991 or later.

But in the end, after the delays and debates played themselves out, the result was a cut in overhead and on spending for outside services (consultants and contract programmers). That money is being used to fund hardware, software and networking purchases considered critical to applications development. The decline in the number of data centers due to consolidation has eased more IS costs than just software licensing fees—fewer glass houses mean fewer dollars spent on real estate, electricity and other overhead costs. Bank of Boston's Simmons says he's consolidating nine data centers for applications running on Digital minicomputers to two: "Those kind of consolidations generate big savings."

Those savings aren't necessarily coming out of IS staffers' pockets. Contrary to some expectations, the proportion of the overall IS budget devoted to personnel appears relatively stable, at 36% this year. Of course, personnel spending by some companies and in some industries will not be stable—27% of the IS shops responding from aerospace, defense and automotive companies predict a decline in their

Survey Available

The MIS Strategic Planning Study from DATAMATION/BRG includes more than 130 pages of data about the 1992 plans and budgets of 1,750 computer sites. The data rank more than 60 applications and 40 technologies that will be deployed this year by 17 sectors. For more information, contact Nancy Finn at the Business Research Group at (617)-630-3900.

head counts due to those industries' declining fortunes.

And consolidation notwithstanding, hardware and software spending will increase by a significant 1.5 and 1.1 percentage points, respectively, in relation to the total IS budget.

Major hospitals and medical center operators represent the most active developers of mainframe-based applications this year—about 31% of the shops surveyed. Health care institutions are turning to centralized mainframe applications for a combination of reasons—the burgeoning size and number of patient medical records, many of which include electronic images; a desire for more efficient security for patient records; and the need for centralized processing for electronic reimbursement. “If we can’t identify what we did, and for whom, and at whose order, we can’t get reimbursed,” explains the IS director of a for-profit health care corporation.

While the fact that 33% of the respondents said they’re working on applications to run on desktop computers is not a surprise, the rise of reduced instruction set computing (RISC) workstations in commercial markets is remarkable. More than 27% of the respondents indicated their shops were developing applications on RISC workstations from Mips Computer Systems Inc., Sun Microsystems Inc. or other vendors. Educational institutions are the leading developers this year—34% are engaged in a RISC-based project. And more than a quarter of the heavy-manufacturing and natural resource companies have also jumped on the workstation bandwagon.

Last year, a number of vendors announced handheld computers amid questions about the utility and functionality of the devices. Despite the dearth of available hardware and software, a startlingly high number of IS managers, more than 10%, report investment in handheld devices. Pro-

prietary designs are popular this year. To speed order entry and other tasks, Avon Products Inc. of New York City, for example, is rolling out a custom-made terminal a little larger than a pack of cigarettes for 20,000 of its door-to-door salespeople this year, according to chief information officer Raymond Perry. The Avon-designed device, built in a Philippine factory supervised by IBM, costs the company less than \$100.

Retail-oriented companies won’t be the biggest user of handheld computers this year, though—24% of the transportation firms report use of handheld devices. “We’re working on a system that would automatically record deliveries, mileage and maintenance information,” says the head of IS for a company with a large truck fleet. “The system will improve our efficiency by automating schedule development and monitoring.”

Considering all the hype from the media and consultants about outsourcing, the 2 percentage point decline in spending for outside services is somewhat unexpected. However, don’t forget that IS managers may be the last to know that part of their budget may be diverted to an outsourcing firm. Dale Wortluft, national director of IS services for Ernst & Young, says that the chief financial or executive officer usually initiates a move to outsourcing. In addition, business unit managers are starting to consider outsourcing when they become disappointed with IS. “We have a request for information right now from a department that is dissatisfied with the applications development area,” Wortluft says. “It had poor response times, no priority for the department’s projects, things take too long and what was produced was not quality output. We’ll see more individual units looking to have something done on the outside.”

Wortluft’s experience could serve as a warning that the current vogue of concentrating on improving operations could be a long-term disaster for IS officials overly focused on efficiency. IS executives who concentrate narrowly on squeezing more code out of their programmers or generating more uptime from the data center may fall into the same trap that ensnared their predecessors in the late 1970s and early 1980s.

More efficient data center operations should not preclude involvement in the business units. Important new IS-based products and services must be proposed, promoted and produced, or else the technologically savvy business unit managers will preempt those opportunities—just as their spending on PCs, workstations and minicomputers have put more MIPS outside the glass house than in it. IS managers should view the renewed interest in their traditional strengths—efficient data center operations, experience with data security and integrity and other standard IS practices—as an opportunity to demonstrate their ability to think like businesspeople and not just like code runners. ■

Larry Marion, a former assistant managing editor of DATAMATION, is an editor and writer based in Newton, Mass. Research provided by Cahners Publishing Co.’s Business Research Group and Virginia Ewell of the Newton-based market research firm Camden Ltd.

Reports on key industry sectors start on page 40.

How We Did The Survey

Two different seven-page questionnaires—one for service industries, the other for manufacturers—were mailed to more than 17,000 IS managers during December 1991 and January 1992. The managers were selected from DATAMATION’s subscriber list and from a database of IS officials supplied by Computer Intelligence of La Jolla, Calif. The recipients were asked to identify their 1992 applications development projects from a list of more than 60 discrete topics. In addition, they were asked to identify which of 44 hardware, software and networking technologies would be used. Approximately 1,750 completed questionnaires were received by late February and sorted into 17 categories. DATAMATION consolidated that information into 10 sectors, presented below.

In addition to the questionnaires, DATAMATION and its sister organization, the Newton, Mass.-based Business Research Group, conducted detailed telephone and in-person interviews with almost 100 top IS officials from various industries to better understand the business dynamics that are driving IS spending priorities.



Sector Benchmarks

Mean IS Budget (\$Millions)

1	Communications	17.2
2	Finance	17.0
3	Transportation	14.8
4	Government	11.0
5	Machinery	9.4
6	Education	6.8
7	Natural Resources	6.0
8	Health Care	5.6
9	Retail	5.3
10	Processors	4.3

Communications Services**

1	Transportation	10
2	Communications	8
3	Finance	7
4	Government	7
5	Natural Resources	7
6	Retail	7
7	Machinery	6
8	Education	5
9	Processors	5
10	Health Care	3

Non IS Technology Spending*

1	Education	24
2	Natural Resources	20
3	Government	18
4	Communications	17
5	Machinery	17
6	Processors	17
7	Health Care	16
8	Retail	14
9	Finance	13
10	Transportation	13

Networking Products**

1	Communications	8
2	Government	8
3	Education	6
4	Machinery	6
5	Natural Resources	6
6	Transportation	6
7	Finance	5
8	Health Care	5
9	Processors	5
10	Retail	4

Mean Head Count

1	Communications	295
2	Transportation	212
3	Finance	206
4	Government	189
5	Machinery	110
6	Health Care	76
7	Education	61
8	Natural Resources	37
9	Processors	36
10	Retail	36

Personnel**

1	Education	44
2	Government	38
3	Finance	37
4	Health Care	37
5	Processors	37
6	Natural Resources	35
7	Retail	35
8	Machinery	33
9	Transportation	33
10	Communications	31

Hardware**

1	Retail	28
2	Communications	26
3	Health Care	25
4	Machinery	25
5	Transportation	25
6	Processors	24
7	Finance	24
8	Natural Resources	23
9	Education	22
10	Government	21

Overhead**

1	Machinery	9
2	Processors	8
3	Retail	8
4	Communications	7
5	Finance	7
6	Natural Resources	7
7	Education	6
8	Government	6
9	Health Care	6
10	Transportation	5

Software**

1	Health Care	19
2	Communications	16
3	Finance	16
4	Natural Resources	16
5	Machinery	15
6	Processors	15
7	Transportation	15
8	Education	13
9	Government	13
10	Retail	13

Outside Services**

1	Government	7
2	Processors	7
3	Machinery	6
4	Natural Resources	6
5	Transportation	6
6	Communications	5
7	Health Care	5
8	Retail	5
9	Finance	4
10	Education	3

* Percentage of the IS budget spent on hardware and software by non IS departments

** Percentage of total IS budget

Source: DATAMATION/BRG



EXCLUSIVE
BUDGET/SPENDING SURVEY

PROCESSORS:

The Big Squeeze

Competition in the commodity segments that dominate the chemical, food, beverage and tobacco industries drives participants to focus on achieving low-cost producer status. Consequently,

IS managers are continually pressed to deliver more precise and comprehensive tools to enable executives to shave costs. "Chemical companies are becoming more globally efficient in every way, including design, production, marketing,

THE HOT APPLICATIONS

- **Records Management**
- **EDI**
- **Inventory Planning**
- **Cost Accounting**
- **Electronic Mail**

sales, delivery and support," explains the MIS chief for a chemical producer.

Electronic data interchange, records management, inventory-planning and cost-accounting systems

are high priorities. Many chemical firms have developed just-in-time systems as well. Sensors in customer storage bins linked to suppliers via a wireless network are replacing traditional order entry. ■

APPLICATIONS

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$4.3 (\$Millions)	3.3% From 1991	17% (As % Of IS Budget)	36 Average	0.9% From 1991

TECHNOLOGIES

Keeping better track of material, deliveries, containers and transport equipment is vital to the efficient operation of a chemical or food processor, and bar code readers will become ubiquitous

this year to close the network loop. Consequently, large chemical and food companies must enhance the performance of their LANs with higher speeds. "We're installing links between our main-frame and our customers' computers, part of an

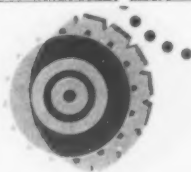
THE HOT TECHNOLOGIES

- **Bar Code Processing**
- **LANs**
- **Client/Server Architecture**
- **GUIs/Windowing**
- **RDBMSs**

effort to improve support and be a partner with our customers," says the vice president of MIS for a major food processor.

Sales and marketing departments need relational

databases loaded onto local servers to keep up with the regional nature of their food-processing industry. End users insist on applications accessed through graphical user interfaces and windows. ■



EXCLUSIVE
BUDGET SPENDING SURVEY

MACHINERY:

Tools For Tracking

Many equipment and component manufacturers view patent-licensing fees as an important source of revenue. So, for both offensive and defensive reasons, systems that track intellectual prop-

erty assets and facilitate patent protection are high on the application lists of the makers of electrical and electronic equipment, motor vehicles and aircraft this year. "The Japanese have invested heavily in systems that track and moni-

THE HOT APPLICATIONS

- **Records Management**
- **EDI**
- **Electronic Mail**
- **Cost Accounting**
- **Network Administration**

tor U.S. patents, with a strategy of bracketing [circumventing] existing patents," says the MIS head of a major electronics company.

Electronic mail and other network-based management

software are also being developed at companies replacing middle management with self-managed teams. EDI in such companies is viewed as a combination cost-cutter, efficiency booster and quality enhancer. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count %Change
\$9.4 (\$Millions)	3.4% From 1991	17% (As % Of IS Budget)	110 Average	-0.4% From 1991

Hard-pressed aerospace companies and vehicle makers view client/server computing on local area networks as part of their push to reengineer design and production. And fewer but

larger data centers supporting product teams appear to be more efficient and cost effective than the mainframe- and minicomputer-based distributed data-processing concept of the past. "It's part of a retrenchment strategy for IS because

THE HOT TECHNOLOGIES

- **Client/Server Architecture**
- **LANs**
- **Bar Code Processing**
- **RDBMSs**
- **GUIs/Windowing**

senior management wants to reduce its capital investment in computers," says one aerospace company IS official.

Bar code readers will continue to be popular in the

auto industry and in aerospace companies. Better materials tracking enhances the effectiveness of manufacturing resource planning (MRP) systems. GUIs and Windows ease training of shop-floor employees using these systems. ■

APPLICATIONS

TECHNOLOGIES



EXCLUSIVE
BUDGET/SPENDING SURVEY

GOVERNMENT:

Networks Win Votes

Local area network-based applications that reduce the cost of operating data centers and end-user departmental systems have helped government IS managers conform to political mandates to

control spending. The mean budget change for 1992 was a 1% increase. As in other sectors, the need for network management software to ease the operator burden is the top priority of government IS officials in 1992. The spread of departmen-

THE HOT APPLICATIONS

- **Network Administration**
- **Office Automation**
- **Budgeting**
- **Electronic Mail**
- **Personnel Management**

tal LANs has led to demands for electronic mail. Updated budget and personnel systems are being built with new database software.

California is reducing its computer costs by replacing

older database packages with a smaller number of newer programs. However, warns Bill Knox, large systems support branch manager at California's data center in Sacramento, "The conversion costs are not trivial."

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$11 (\$Millions)	1.0% From 1991	18% (As % Of IS Budget)	189 Average	-0.1% From 1991

IS shops in government agencies love LAN technology—the server and other hardware becomes turf they can call their own when management looks to eliminate "their" data centers.

Agency heads hope maintenance and overhead of LAN operations will be lower than they have been for mainframe data centers. They're hoping, but they're not sure. "We're off-loading applications from the mainframe to networked PCs, but we've

THE HOT TECHNOLOGIES

- **LANs**
- **Client/Server Architecture**
- **GUIs/Windowing**
- **RDBMSs**
- **Desktop Computers**

been only marginally successful so far," Knox says.

Many government agencies are reducing the number of approved hardware and software products in a given category to cut their

support costs. But the need to improve productivity by making computing easier has stoked demand for a graphical user interface and windowing software—49% of government sites report a GUI/Windowing project this year.

APPLICATIONS

TECHNOLOGIES



EXCLUSIVE
BUDGET/SPENDING SURVEY

FINANCE:

Bouncing Checks

Development of expert systems to review insurance forms and other glitzy applications are out at the IS departments of most banks, securities firms, insurance companies or diversified finan-

cial institutions in 1992. This year, IS officials in the financial-services industry are developing applications that will reduce their mainframe costs, eliminate employees and provide closer scrutiny over bad loans, claims and securities.

THE HOT APPLICATIONS

- **Network Administration**
- **Financial Reporting**
- **Claims Processing**
- **Office Automation**
- **Loan Processing**

Hundreds of local area networks have blossomed as financial institutions downsize mainframe-based applications. So, as in most sectors, IS managers face an ever more daunting task of network management. Banks are also keen to develop automated loan-processing systems, which improve service, reduce personnel and processing costs and provide closer portfolio scrutiny for top executives and regulators. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$17.0 (\$Millions)	2.6% From 1991	13% (As % Of IS Budget)	206 Average	0.2% From 1991

Topping financial IS managers' shopping lists this year are network servers and software for client/server computing. The LANs and servers are replacing a multitude of incompatible

departmental data centers with a more streamlined and homogeneous computing resource.

Image processing has become routine at many financial organizations, as the cost of the technology declines and the cost of processing checks and

THE HOT TECHNOLOGIES

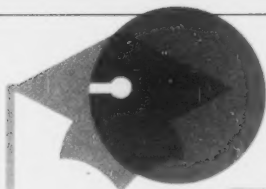
- **Client/Server Architecture**
- **LANs**
- **GUIs/Windowing**
- **Image Processing**
- **Desktop Computers**

other paper instruments climbs. Several banks, such as the Bank of Boston, are developing image-processing applications that seek to capture not only the image of a check but the data on it.

With such a system, these banks hope to replace the expensive process of returning checks to their customers with single-page images of those checks, and reduce some of the work involved in automated check processing. ■

APPLICATIONS

TECHNOLOGIES



EXCLUSIVE
BUDGET/SPENDING SURVEY

E D U C A T I O N :

LAN Lessons Learned

As personal computers become ubiquitous in the college student dorms and apartments, IS administrators are facing a geometrically increasing network burden. Local area network

management chores have become extreme due to the mix of node technologies: Macintoshes and IBM PCs in the dorms; reduced instruction set computing workstations in the physics labs; mini-computers and mainframes in the data centers.

THE HOT APPLICATIONS

- **Network Administration**
- **Electronic Mail**
- **Personnel Management**
- **Budget Planning/Tracking**
- **Accounts Receivable**

Zero budget growth in the wake of cuts in state aid has forced many universities to substitute software for labor to automate operations, maintenance, training and development, IS managers

say. Data are being entered via telephone or remote PCs rather than paper forms. Several colleges are revamping their legacy systems, such as accounts receivable, from batch to real-time processing. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$6.8 (\$Millions)	0.0% From 1991	24% (As % Of IS Budget)	61 Average	-0.1% From 1991

APPLICATIONS

TECHNOLOGIES

Speedy RISC workstations have been taking college labs by storm over the past five years, and that wave will continue to swell in 1992—53% of the IS managers in education responding

to the survey expect to buy RISC-based workstations this year. Considering the growth of the workstation population and demand for electronic mail, it shouldn't come as a surprise that 49% of the schools are adopting fiber-optics as their pri-

THE HOT TECHNOLOGIES

- **RISC Workstations**
- **Fiber-Optics**
- **LANs**
- **Client/Server Architecture**
- **GUIs/Windowing**

mary networking medium. It is cost effective to link their buildings into campus-wide networks.

Improving the quality of IS services for faculty, administration and students is

the rationale behind the interest in graphical user interfaces and windowing. Many university IS departments see GUI front ends as a way to attract and keep students and faculty who need smooth and easy access to text databases. ■



EXCLUSIVE
BUDGET/SPENDING SURVEY

RETAIL:

A Tighter Fit

The pressure on retailers to reduce their time to market and their transaction costs has launched a mad scramble to develop electronic data interchange systems this year. About half of the

retailers surveyed say they're working on them. Other applications related to optimizing sales, such as inventory-planning and purchase-order-processing systems, are also high priorities this year, explains the head of MIS for a major retailing

THE HOT APPLICATIONS

- **EDI**
- **Inventory Planning**
- **Purchase Order Processing**
- **Electronic Mail**
- **EIS**

chain. Optimized store inventory systems will eliminate the need for warehouses.

Top officials of the retailing giants pride themselves on being attuned to market conditions, and faster access

to detailed sales and inventory data on a real-time basis via executive information systems is considered essential. An EIS, coupled with the networks and inventory software, can "guarantee consistent pricing across stores," says an IS official. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$5.3 (\$Millions)	6.1% From 1991	14% (As % Of IS Budget)	36 Average	1.5% From 1991

Fast and accurate translation of the universal product codes printed on cans, boxes and other packages is the top priority of retailers and wholesalers. In addition to new generations of super-

market scanners, IS managers say, handheld units with wireless links to the CPU are being incorporated into inventory management systems this year. "In 1992, the big applications will focus on reducing the cost of moving and process-

THE HOT TECHNOLOGIES

- **Bar Code Processors**
- **LANs**
- **Client/Server Architecture**
- **Desktop Computers**
- **Minicomputers**

ing inventory," says the head of MIS for a major retailer.

Several retailers have led the industry in cutting costs and improving customer service by using both local-

and wide-area networks, and their competitors and suppliers are being forced to follow suit. "If a company doesn't invest in technology, it will fall by the wayside," laments a supplier about to connect his computers to a retailer. ■

APPLICATIONS

TECHNOLOGIES



EXCLUSIVE
BUDGET/SPENDING SURVEY

HEALTH CARE:

Record Systems Cured

Real-time patient record systems under development this year will improve the productivity of physicians and their support staff. Doctors will be able to review records from their offices

rather than having to go to the hospital. Also, automated record-keeping systems will help reduce physicians' paperwork: "Point-of-care terminals will be used to replace handwritten patient charts," predicts the IS chief at a major

THE HOT APPLICATIONS

- **Physicians Link**
- **Records Management**
- **Clinical Decision Support**
- **Patient Care**
- **Radiology**

medical center.

The explosion in medical testing has ballooned the data-storage requirements of hospitals and physicians' offices. The need to streamline records administration

and receive prompt reimbursement from third-party payers has propelled record-management systems to a high priority. In addition to medical records, images from CAT scanners and other devices are being stored electronically. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$5.6 (\$Millions)	8.6% From 1991	16% (As % Of IS Budget)	76 Average	3.1% From 1991

TECHNOLOGIES

Electronic patient record systems require robust networks running throughout the hospital complex. The need for complete and accurate reimbursement has led many health-care providers

to use bar code scanners to track the use of syringes, drugs and other paraphernalia. "The expanding centralized hospital system requires integrating LAN-based systems and remote locations with the mainframe through the use of

THE HOT TECHNOLOGIES

- **LANs**
- **Bar Code Processing**
- **Fiber-Optics**
- **Desktop Systems**
- **Optical Discs**

bridges and wide area networks," says a medical center MIS director.

The need to transmit graphics-laden medical records to specialists over networks is pushing many medi-

cal centers to use fiber-optic cables. A heavier graphics load is also fueling the use of optical discs for long-term storage. "Imaging for medical records is definitely happening," affirms an IS official. ■

APPLICATIONS



COMMUNICATIONS:

System Calls Soar

Faulty or inflexible billing systems have been the bête noire of major communications vendors. As competition intensifies, vendors are redoubling their efforts to develop the tools to offer more

customized bills to commercial customers. Competition is also pressuring profit margins, and communications firms need new financial-reporting systems to more closely monitor their financial performance. Executive information systems are

THE HOT APPLICATIONS

- **Billing**
- **Financial Reporting**
- **Office Automation**
- **Electronic Mail**
- **EIS**

being used to monitor operations and to develop new products and services.

An increased use of electronic mail for internal communications allows communications companies to re-

duce levels of management, another priority of cost-conscious firms. "Since the network is our business, it behooves us to use it as extensively as possible," says the chief information officer of a major communications services vendor. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$17.2 (\$Millions)	3.2% From 1991	17% (As % Of IS Budget)	295 Average	0.4% From 1991

Communications companies are major adopters of the client/server architecture using local area networks, as their IS organizations evolve into a combination of centralized services and decentral-

ized support. "Certain applications are more appropriately centralized to achieve economies of scale among a group of business units, while other applications are more appropriately decentralized if they only are used by one unit," notes a CIO.

THE HOT TECHNOLOGIES

- **Client/Server Architecture**
- **LANs**
- **GUIs/Windowing**
- **Laptops**
- **RDBMSs**

The head of MIS reports that no new mainframe applications are being developed by his shop. However, he needs better CASE tools to build distributed applications on a network.

Laptops are popular among executives, as well as the field sales forces, for remote access to the e-mail networks. Relational database management systems are used as marketing tools to identify potential customers for new services. ■

APPLICATIONS

TECHNOLOGIES



EXCLUSIVE
BUDGET/SPENDING SURVEY

TRANSPORTATION:

Cheap Moves Ahead

A weak economy and a static market for transportation services demands ever more efficient operations, and IS managers at airline, trucking, railroad and shipping concerns are upgrading existing systems to keep their firms competitive. Enhancing internal and external communications via electronic mail is a key project at many transportation company IS shops this year. Desktop publishing is vital for the industry to produce

THE HOT APPLICATIONS

- **Electronic Mail**
- **Publications**
- **Trip Scheduling**
- **Maintenance Tracking**
- **Personnel Management**

up-to-date schedules and rates. Optimal use of assets like trucks and buses has made scheduling and maintenance applications high priorities this year, IS managers report. "Our strategic

push is moving from basic accounting operations into logistics," notes the head of IS at a major trucking firm. Human resource management systems are being used as the platform for training crews and salespeople. ■

APPLICATIONS

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$14.8 (\$Millions)	1.6% From 1991	13% (As % Of IS Budget)	212 Average	2.6% From 1991

TECHNOLOGIES

Several technologies are being used to tie field workers at a dock, freight yard or airport into networks linking regional operations and headquarters. Portable computers, sometimes with cellular modems, are being used by some companies to provide real-time shipment data to the enterprise and to customers. Seeking applications portability and interoperability, transportation IS managers are increasingly basing these networks on

THE HOT TECHNOLOGIES

- **LANs**
- **Client/Server Architecture**
- **Minicomputers**
- **EDI**
- **Laptops**

minicomputers running UNIX. They're porting mainframe-based applications over to minis as servers for the LAN to provide lower cost distributed processing.

They're upgrading EDI sys-

tems to handle more complex transactions. "While EDI is not new for this industry, its use is being expanded to include more suppliers, smaller customers and global operations," says the IS director of a major freight company. ■



**EXCLUSIVE
BUDGET/SPENDING SURVEY**

NATURAL RESOURCES:

Greasing The System

Efficient communications among the far-flung operations of companies in the oil exploration, mining and forestry industries is the top applications priority for their IS managers. Network

administration is the high-profile project at most natural resource companies these days, owing to the strong demand for smooth data interchange among the various local and wide area networks linking production, marketing and transportation

THE HOT APPLICATIONS

- **Network Administration**
- **Personnel Management**
- **Electronic Mail**
- **EIS**
- **Maintenance**

departments. Top managers are depending on EIS to more precisely forecast trends.

Because personnel are scarce in this industry, human resource management

systems that optimize staff utilization are also high on IS managers' applications lists. "This is a capital-intensive industry with few people," explains an oil company IS chief. HRM systems also track safety-training progress, he adds. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
\$6.0 (\$Millions)	2.1% From 1991	20% (As % Of IS Budget)	37 Average	-1.0% From 1991

APPLICATIONS

TECHNOLOGIES

Supercomputers have been the standard at oil companies for years, but powerful LANs linking reduced instruction set computing (RISC) workstations in a client/server architecture have

also become widespread in seismic analysis departments of the major oil companies. "We have as many MIPS in workstations as we do in mainframes and Crays," says the head of MIS at one multinational oil company. More powerful

THE HOT TECHNOLOGIES

- **Client/Server Architecture**
- **GUIs/Windowing**
- **LANs**
- **RISC Workstations**
- **RDBMSs**

workstations based on parallel processing architectures are needed for computationally intense mapping applications. Database-dependent mapping of potential mineral deposits have re-

quired more powerful workstations and relational database management systems designed for client/server computing. And petroleum engineers are demanding more user-friendly interfaces for their UNIX-based machines. ■

One Last Chance For ISDN

After years of hyperbole and delay, ISDN is back with a much more realistic agenda.

Few communications technologies have been more overhyped or the butt of more jokes than the Integrated Services Digital Network (ISDN). Yet if ISDN supporters realize within the next year their goal of a national standard and reduced prices, ISDN may have the last laugh.

Today's definition of success for ISDN has narrowed in scope from that of just a few years ago. Briefly described, ISDN is a public switched service that allows the digital transport of voice, data and image communications over one network. While that description hasn't changed, few still believe that ISDN will be the only network service of choice or that an incredible crop of new applications will arise just because of its existence.

"The benefits of ISDN are not home run benefits," says David Telleen-Lawton, senior consultant at Frank H. Robinson & Co. Inc., a Santa Barbara, Calif., consulting firm. "ISDN does make things more convenient, but that's a hard sell."

For the leading edge of customers, ISDN has had some quiet successes. It has allowed some users to replace private branch exchanges (PBXs), modems and expensive leased lines. Its usefulness is also being explored for backing up private lines, providing on-demand bandwidth to supplement over-used private networks, handling video-conferencing and graphics applications, and for handheld PC communications.

Perhaps the best known ISDN application is automatic number identification, or ANI, which is widely used in customer service operations and telemarketing. ANI displays the caller's phone number even before the phone is picked up. This allows businesses to tie

nologies are the bandwidth and network management features."

Indeed, because ISDN offers 64-kilobit-per-second increments, it is far faster than most modems. IBM product marketing manager Virginia Haggerty sums up the difference: sending a 50-page document with a 2,400-baud modem takes approximately eight minutes. Using ISDN, that document is sent in 15 seconds. Likewise, says Brent Bilger, product line manager for router manufacturer Cisco Systems Inc. of Menlo Park, Calif., ISDN sets up data transfers in less than two seconds; a modem can take up to 30 seconds to set up the same call.

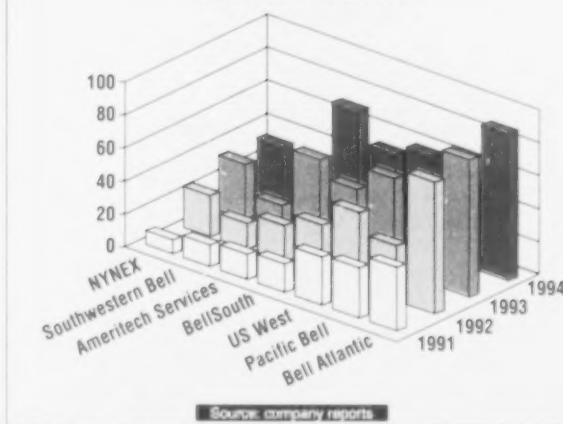
According to a July 1991 survey of 200 computer-assisted telephony users conducted by Business Research Group, a subsidiary of Cahners Publishing Co. in Newton, Mass., 7% of respondents currently use ISDN and 56% will potentially use it over the next two years.

Most interesting is the discovery that 42% intend to attach local area networks to ISDN. These users won't replace LANs with ISDN. Rather, they'll use ISDN to connect LANs to other devices, such as packet-switched networks, PBXs, workstations and host computers.

Ironically, while ISDN has been tested mainly by large corporations, its true potential may lie in smaller and mid-sized companies that can't afford more expensive alternatives. ISDN has already been replaced in the minds of telecom managers by frame relay and

How The Baby Bells Call Up ISDN

% Of Lines In Wire Centers Planned
To Have ISDN Presence



Source: company reports
■ When it comes to ISDN implementation, some of the regional phone suppliers are moving faster than others.

their phone systems into customer databases to speed call processing.

Supporters now say that it is likely there may never be another application as dependent on ISDN as ANI, and the emphasis should be on additional ways ISDN can save users money and time. "To a telecom person, ANI is no big Watusi," comments Lisa Hoesel, senior telecommunications specialist for U.S. Bancorp in Portland, Ore. "What I like about ISDN and other tech-

BY SUSAN KERR

switched multimegabit data services. As a way of defining the three, ISDN is more likely to serve lower-speed packet and circuit-switched applications, whereas frame relay is a more expensive alternative for large business networks that need 56Kbps to 1.5 megabit-per-second packet switching. Switched multimegabit data services (SMDs), with speeds of up to 155Mbps, are for the very high end of the spectrum.

Still, setting a realistic price/performance tag for ISDN is next to impossible because of factors such as volume discounting and variable equipment needs.

Although he refuses to provide tangible dollar comparisons, Richard Campbell, ISDN product manager for AT&T in Bedminster, N.J., says that the crossover point between ISDN and alternative line services depends on network traffic, frequency of use and available discounts. In some cases, he says, using the network for only two to three hours a day means that ISDN is more cost effective. Dean Wolf, marketing manager for San Jose-based Fujitsu Network Switching of America Inc., says the average monthly fee for a switched 56Kbps line from the local telephone company ranges from \$45 to \$200, depending on region. A comparable ISDN service charge begins at approximately \$30.

Equipment prices are also becoming more attractive, although they're still high. ISDN terminal adapters cost around \$1,500, which is at least twice as much as modems, but customers should see prices continue to drop. And in some cases, if customers move to Centrex-based ISDN, they actually get rid of their PBXs in the process.

In his detailed study of 10 Basic Rate Interface (BRI) customers, consultant Telleen-Lawton discovered that four of them replaced their PBXs after ISDN came aboard. Another customer in the study found that the cost of the PBX equaled that of the ISDN service, but he no longer needed the support structure associated with owning private commu-

nications equipment.

Yet despite these and other potential ISDN selling points, the major problem with ISDN is that there have been so many barriers, both technical and nontechnical, to its use. U.S. Bancorp first started with ISDN four years

ago. It is interested in ANI, but is limited to using the technology internally only, because Washington and Oregon have restricted the use of caller identification out of privacy concerns.

U.S. Bancorp has also tested ISDN for automatic teller machine transactions and computer terminal adapters. Despite its success with these trials, U.S. Bancorp is hindered by the market, primarily because not all tariffs have been set for the service in its area. And the problems run deeper than that. Although it has been four years since AT&T became the first long-distance carrier to announce ISDN tariffs, neither interconnectivity among different telephone service providers nor interoperability among various makes of customer premises equipment is here yet. The local telephone carriers particularly have lagged behind—many do not offer ISDN service to a noticeable percentage of their customer areas.

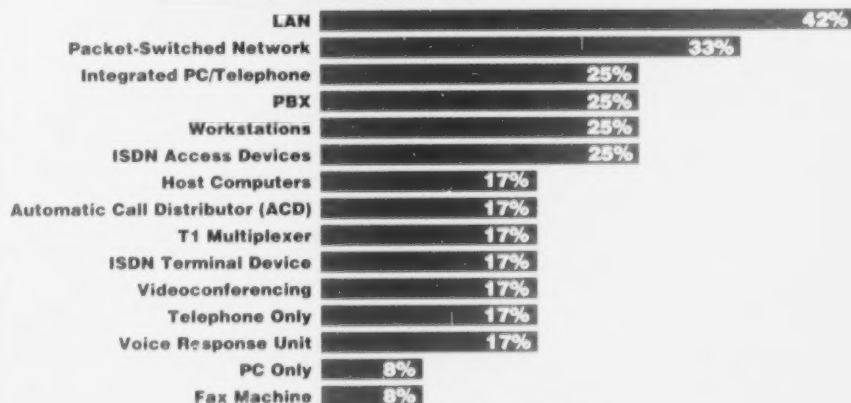
Realizing that they better move now, Bell Communications Research Inc. (Bellcore) and the regional phone companies are spearheading National

ity testing.

NI-1 promotes a standard BRI protocol. The next step, known as National ISDN-2, looks toward establishing uniform Primary Rate Interface (PRI) services and will be defined by Bellcore later this year. BRI specifies two bearer (or "B") channels, each operating at 64Kbps, and one signaling ("D" for Delta) 16Kbps channel. PRI specifies 23 B channels and one D channel.

AT&T, Northern Telecom Inc. and Siemens Stromberg-Carlson announced last year that they will modify their switches to conform to the standard, so ISDN users no longer will have to worry if their equipment is compatible with whichever switch is handling calls. One caveat: the regional Bell operating companies are starting to deploy NI-1 this year, but at varying rates. According to Bellcore, last year the percentage of lines in RBOC wire centers with an ISDN presence ranged from 8.3% in NYNEX Corp.'s territory to 37.9% in Bell Atlantic Corp.'s territory. By 1994, the RBOCs say, these numbers will range from 16.3% in Southwestern Bell Telephone Co. terri-

Making The ISDN Connection



Source: Business Research Group, July 1991 study

■ Current users of computer-assisted telephone systems planning to implement ISDN intend to attach these devices to their networks over the next two years.

NETWORKS

ISDN

tory to Bell Atlantic's 87%.

The key to ISDN is ubiquity, and until that's reached its usefulness is severely limited. "A lot of users want public networks to access remote locations, but the carriers instead have been putting nodes in San Francisco, not in the heart of Oregon," points out Rosemary Cochran, a principal with Vertical Systems Group in Dedham, Mass. "Yet big cities are where customers have a concentration of usage to justify private lines."

Basically, manufacturers and service providers are waiting for the market to swell before putting in a full-hearted ISDN effort. But that rubs some users the wrong way. "I don't give IBM money to build me a new computer. They build it, and then I order it. You need something out there first," says Edward Hodgson, manager of computing and communications for Schindler Elevator Corp. in Morristown, N.J. Nonetheless, Hodgson is a cofounder of the North American ISDN Users Forum and a staunch supporter

of the service. "We have a large leased network, and that is a real pain," he says. "We also want to put in a centralized imaging system, but [without ISDN] we couldn't figure out how to access it without going broke."

Schindler currently has 37 field sites

To a telecom person, ANI is no big Watusi.

tied into the headquarters over leased lines, and Hodgson would like to replace some 56Kbps lines while keeping intact T1 networks. But his real goal is to allow elevator service people to go into the field with portables and use ISDN to call headquarters and retrieve images of the parts being serviced. Modem speeds are too slow for that application, and leased lines couldn't even be considered because they're too costly.

Schindler plans to get this ISDN application rolling within the next two years.

Another handheld PC application is in the works at Johns Hopkins Health System in Baltimore. Clerks audit supplies in storerooms with handheld devices whose memory capacity fills very quickly. The clerks used to go back to a central location, where someone else would transfer the data to a mainframe. "With ISDN, we have a fast and error-free way to download data," says Edward Thyberg, manager of network communication systems. "It allowed us to do things that would be cost prohibitive before."

"ISDN isn't going to succeed at the exclusion of everything else," says Tom Hunter, senior planner in IBM's ISDN System Development group based in North Carolina's Research Triangle Park. "If the service is available at points where you need to move data, then it gets down to evaluating the service and cost." His hope—and that of many users—is that evaluation will be more positive this year. ■

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How To Avoid The Pitfalls Of Downsizing

Forget the utopian hype. Downsizing from mainframes to workstations is a tough job. But these basic principles can make it work.

By any measure, workstation price/performance not only beats that of the mainframe but is widening its lead.

Why, then, do IS sites move so cautiously into this new world, downsizing in piecemeal fashion only?

One answer is that downsizing requires much more than faith in the superior price/performance of the workstation. Downsizing the wrong application can inflict software conversion costs far greater than the amount saved by a new hardware platform.

There are three important ways to avoid the pitfalls of downsizing and enjoy its rewards:

- Research compatibility issues carefully.
- Handle organizational issues up front.
- Understand the business problem the application is supposed to solve.

Maintaining compatibility is the key determinant in moving applications from the mainframe to the desktop. But ensuring compatibility doesn't mean asking general questions such as: "Do both platforms have a COBOL compiler or a relational DBMS?" True software compatibility means detailed, point-by-point comparison of software features, syntax, semantics and behavior.

To appreciate what may be involved in downsizing an existing mainframe application, consider merely the database portion of that application. On the mainframe, if the application uses DB2, the equivalent IBM product for the desktop is the OS/2 Database Manager.

What incompatibilities are there between these two database products that could block a downsizing effort?

Several, actually. IBM's Systems Application Architecture (SAA) Database Reference manual asserts that nearly 100% of the Structured Query Language (SQL) elements it lists are com-

ent for physical objects; and the Data Control Language is also largely different, since SQL GRANTS and REVOKES operate on different objects.

How much these incompatibilities affect downsizing of an application depends on how much that application employs the unique features of DB2. Of course, the developer could alter the application to take advantage of features unique to the OS/2 Database Manager or to optimize the application for the downsized architecture. Software designed for mainframe transaction processing, for example, may perform quite differently with a DBMS client/server architecture on a LAN.

Differences between database management systems extend well beyond those of the various SQLs. DBMS internals and operation differ in respect to relational catalogs and directories, storage mapping, security, limits, locking, isolation levels, binding, logging, backup, recovery, referential integrity and utilities. Consider just one category, utility processing. DB2 production utilities must be entirely rewritten to support the same application under the OS/2 Database Manager. Look at the differences between the two products' catalogs: the Database Manager catalog is not a simple subset of that used by DB2; applications directly dependent on the catalog must be altered appropriately or they may abend. Without disparaging these products, their incompatibilities show why



DANIEL GUIDERA

mon between DB2 and the Database Manager. But the SQL reference manuals for the two products show that many SQL statements exist in one product and not in the other. Even among SQL statements common to both products, parameters may be unique to one.

The bottom line on SQL compatibility is that the data manipulation language is the same between DB2 and Database Manager; the data definition language is the same for logical objects but differ-

BY HOWARD FOSDICK

downsizing is far from simple.

The downsized application's terminal interface requires the same depth of analysis as its data storage. Mainframe applications typically use the Customer Information Control System (CICS) or IMS/VS transaction monitors, or possibly even the ISPF Dialog Manager, Time-Sharing Option (TSO) or Conversational Monitor System (CMS) services for terminal management. PC applications control screens through Windows, OS/2 Presentation Manager or some other graphical user interface (GUI) generally unavailable on mainframes. In the few cases where full compatibility is possible, the downsized application forgoes the advantages of the workstation user interface. For example, downsizing from mainframe CICS to CICS-OS/2 means compatibility, but it also means application changes if one seeks GUI advantages.

Extend these comparisons of DBMS and terminal software compatibility to application generators, debugging tools, expert system shells, natural-language interfaces, fourth-generation languages, programming languages, computer-aided software engineering tools and their generators, versioning and change-management tools, performance-monitoring and tuning products, and all the other software necessary to applications development, operation and maintenance. Compatibility questions quickly separate existing applications into two groups.

Newer applications, those developed

since SAA and the growth of the cross-platform tools market, may be fully compatible. Many current application development environments are designed specifically for cross-platform use. These tools include certain 4GLs, application generators and expert system shells. They make downsizing a low-risk, high-payoff deal.

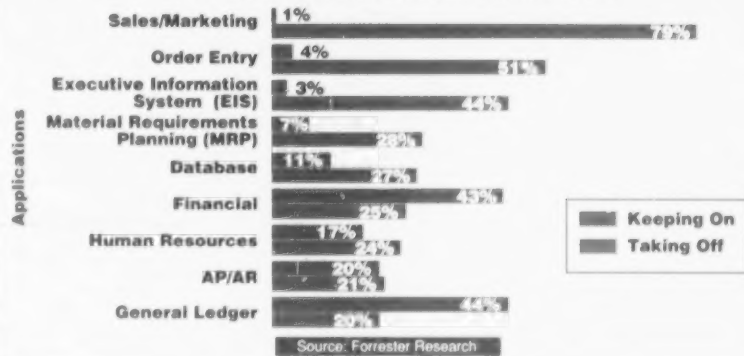
But many older applications, the very ones that have the most to gain from downsizing, often employ unique, antiquated and therefore incompatible mainframe software. They were written before there was much interest in cross-platform compatibility and well before downsizing, SAA compatibility guidelines or the current generation of cross-platform development tools were conceived. Even with the current generation of sophisticated workstation

products able to emulate mainframe software, is must carefully research compatibility. IBM's recent transformation of its SAA goals from cross-platform software compatibility to cooperative processing underscores the difficulty of creating truly compatible hardware/software platforms.

Organizational realities affect all downsizing approaches. Take training. To the extent that the software environments of the mainframe and downsized platform are compatible, training costs are minimized. Even where software compatibility is not complete, IS professionals may be able to bridge the gap. For example, while minor differences in SQL between the mainframe and downsized platform may be disastrous for program compatibility, programmers can make the transition easily. A

Staying On Or Coming Off The Mainframe?

% of 75 Fortune 1,000 companies interviewed



The Downsizing Culture Clash

Translating mainframe administration standards and practices to a new hardware environment is the great, hidden challenge of downsizing. The cultural transformation that downsizing requires is even more critical than hardware and software issues, yet it remains largely unexamined and unmanaged.

The pitfalls of downsizing software are all too easily illustrated when the organizational culture is not downsized first. The lapses described here demonstrate how far is has to go. Names of companies have been withheld to protect the negligent from embarrassment.

- One company operates a transactional client/server database application on a local area network, but performs recovery only to the point in time of the last image copy, even though it provides latest-

commit-point recovery on its mainframe databases.

- Another company runs mission critical database and analysis applications on workstations without backup procedures.

- A third operates a LAN without informing its users of network changes or reconfiguration of individual workstations. The same company routinely notifies mainframe users of changes via time-sharing option broadcast messages.

- Still another corporate user runs on its workstation network the same kind of versioning and change-management software that is part of its mainframe development environment.

- Other companies lack either manual or automated procedures for software distribution or inventories of the purchased software running on their workstations.

SOFTWARE

DEVELOPMENT

database program that directly uses a relational DBMS catalog may abend when ported to a DBMS with a differing catalog, but for IS professionals the mental transformation between catalogs may be simple.

But what about those areas of total incompatibility? An application that uses CICS on the mainframe and is ported to an OS/2 Presentation Manager environment is an example. Learning PM programming is every bit as difficult as learning CICS programming. IS sites face a major training hurdle in deploying their mainframe programmers on such a conversion project.

Here's a simple formula to apply: the size of the training effort is proportional to the size of the compatibility gap between the mainframe and downsized environments.

Another organizational challenge is identifying the best applications for downsizing. This requires a thorough understanding of the current applications portfolio and business needs of

the company. Departmental applications, query applications, those that need to be redesigned for a GUI, those that are being enhanced anyway and those that scale well are often prime downsizing candidates. Applications that rely on the traditional mainframe infrastructure are not good candidates.

Downsizing the wrong application can inflict steep software conversion costs.

An application that relies on the mainframe-based operations department to schedule batch jobs and burst and distribute reports within the company might not work well in the same firm's local area network. Perhaps the application's batch philosophy should be altered to that of a dynamic query envi-

ronment. An application-by-application approach to downsizing is the safest way to proceed, because companies gain experience as they progress.

Many industry analysts promote an appealingly simple, high-level vision of downsizing. The work-a-day reality is this: where IS understands software compatibility and carefully selects applications, and where organizational challenges are addressed first, downsizing existing code presents a tremendous opportunity to do more for the organization at reduced cost. Glossing over compatibility issues and ignoring the implications of downsizing can produce a costly exercise in converting applications that already work, as well as a long, difficult period of what is euphemistically called "organizational adjustment."

Howard Fosdick is both industry analyst and hands-on technician. As an independent consultant, he specializes in IS software for mainframes and PCs.

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CASE Use Is Growing, But In Surprising Ways

Most mature IS organizations still just use CASE tools to help with administrative dirty work and not for full-blown application design.

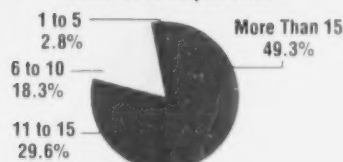
Use of tools for computer-aided software engineering has exploded in the past decade. These tools have improved productivity and reduced the time and resources needed for many types of information systems projects. One of the most frequently cited benefits of CASE is more efficient front-end application development. For example, automated graphics capabilities free analysts to focus on analysis and design rather than on the analysis and design tools themselves. This is thought to be especially true for small-scale projects (see "Reaping CASE Harvests," July 1, 1989, p. 31).

But for large-scale projects, a recent nationwide survey of systems analysts indicates that although CASE is used, it is used differently than expected.

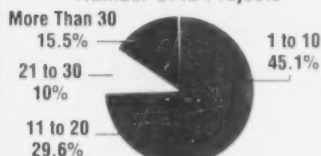
A total of 71 systems analysts responded to the survey. Almost half (49.3%) have worked in IS for more than 15 years; close to half (45.1%) have worked with fewer than 10 projects.

CASE Users: A Profile

Years Of IS Experience



Number Of IS Projects*



*Figures do not add up to 100% due to rounding.

Source: Jones and Arnett

BY MARY C. JONES
AND KIRK P. ARNETT

All have worked with projects that require at least two person-years to complete.

Responses to this survey indicate that CASE tools are used much more extensively than earlier studies have shown. In this survey, 66.2% of the systems analysts said that they use CASE to some extent; earlier studies indicated that CASE was used in fewer than one-third of the organizations examined (Necco, Charles, "Current Usage of CASE Software," *Journal of Systems Management* [May 1989], p. 6). The use of computerized tools to support the IS design/development process is unquestionably growing.

CASE can support all aspects of the IS process, including planning, analysis, design, implementation and support. Specific IS activities addressed in this survey include documentation, graphics (e.g., dataflow diagrams), data dictionaries, project management, prototyping, code generation and cost/benefit analysis.

Virtually every CASE software package on the market provides graphics capabilities; even the least powerful CASE packages can produce dataflow diagrams or entity-relationship diagrams. As a result, one would expect to find that graphics support is the most frequent use for these automation tools. Survey findings show otherwise.

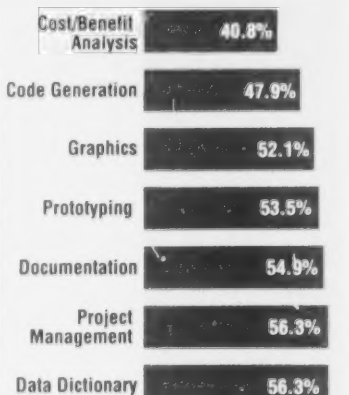
Respondents say they use CASE capabilities most frequently for project management and for data dictionaries; each of those were cited by 56.3% of the respondents. The next most popular

use is documentation, cited by 54.9%. Then comes prototyping with 53.5% and then graphics with 52.1%. Just 47.9% of the analysts say they use CASE for code generation, and only 40.8% say they use cost/benefit analysis features in CASE.

At first glance, it seems surprising that so many analysts primarily use CASE for project management. Considering the large scale of these analysts' projects, however, extensive use of this capability is actually quite logical.

Large projects involve many activities and complex relationships. It is necessary to break projects into tasks, track schedules and generate progress reports. Statistical project-management tools such as Program Evaluation and Review Technique (PERT) or Gantt charts have long been used to facilitate completion of these types of projects. If the automation tools used for analysis, design and development also support

Popular Uses For CASE



0 10 20 30 40 50 60

Source: Jones and Arnett

MANAGEMENT

SOFTWARE DEVELOPMENT

project management, they may well come to be used primarily for project management. Such tools may provide an ideal mechanism for managing the development of large IS projects.

Data-dictionary development is often an unwieldy and lengthy process that involves listing and cross-referencing data elements, ensuring consistency among modules, eliminating synonyms and homonyms and ensuring that data are consistently defined and properly used.

Without automation, updating a dictionary to reflect even one change in a system may be very time consuming. Automation lets analysts quickly develop and update the dictionary while preserving the integrity and reliability of data elements.

Documentation support, the third most popular use for CASE tools, is also a cumbersome and inefficient process. Veteran IS professionals sometimes regard it as a necessary pain in the neck. It is often done as an afterthought, after a module of code is written or after two or more modules are put together.

As a result, documentation may contain errors, inconsistencies and ambiguities that are difficult to detect. In large projects it may be difficult to access all current documentation, and it is difficult and time consuming to update documentation to reflect system changes. Using CASE software's documentation features frees the analyst and ensures more accurate and complete documentation.

Prototyping, the next most popular use of CASE, is not as widely used. But 65.45% of the respondents who build prototypes say they use CASE tools to

do so. In addition, almost 90% of those who use CASE to support prototyping also indicate that they use one or more fourth-generation languages. This is not surprising, given the popularity of 4GLs for building IS prototypes. This is also consistent with the wide variety of combination CASE/4GL database-management tools available today.

Analysts may design databases, screens and reports with software-engineering workbench tools, yet may never use CASE tools' graphics capabilities. There are two possible causes for the limited use of CASE tools for graphics.

First, most CASE tool packages are oriented toward structured methodologies that represent the activities of a system using dataflow diagrams or entity-relationship diagrams, rather than representing temporal relationships with the more traditional system flowcharts. In this survey, 91.5% of the CASE users said that they use system flowcharts; whereas 87.5% said that they use dataflow diagrams.

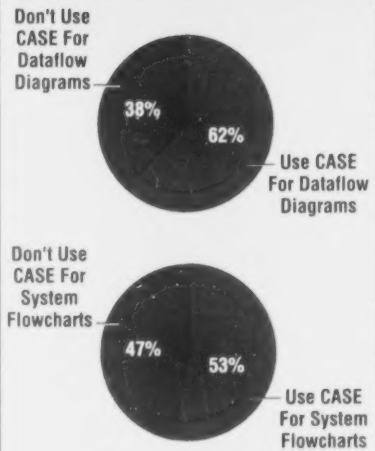
The preference for system flowcharts not supported by most CASE products could affect the use of graphics capabilities. However, 53.15% of the system-flowchart users also said they use the graphics capabilities in CASE, compared with 62.26% of the dataflow diagram users.

The second explanation derives from the heavy time investment required to implement CASE tools. There is no CASE tool standard that allows an organization to purchase a package specific to one or another development approach (e.g., Gare and Sarson, Yourdon, etc.). Thus, those analysts must learn a new design approach as well as the use of a new product.

One study indicates that more than 80% of organizations alter their methodologies as a result of using CASE tools. Analysts may prefer to continue their current methods rather than invest time and energy in using automated graphics capabilities.

It is not surprising that CASE tools are used less for code generation and for cost/benefit analysis than for other activities. Most organizations have standardized approaches and existing packages for performing cost/benefit analysis. Therefore, the use of this feature in

CASE Graphics Preferences



Source: Jones and Arnett

a CASE package may be viewed by many in IS shops as unnecessary.

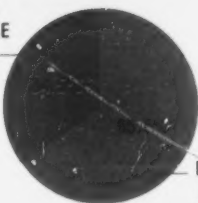
Heavy COBOL use, coupled with the absence of CASE COBOL code-generation capabilities, may help to explain why CASE is not widely used for code generation. The code-generation features available in many CASE packages are primarily oriented toward creating 4GL code. Approximately 80% of the respondents indicate that they are using one or more 4GLs, yet more than 70% of the respondents indicate that they are using COBOL for the majority of their applications. Another explanation is that COBOL code generators have existed for at least 20 years. Therefore, IS shops may have purchased stand-alone generators for COBOL or rejected generators altogether before CASE was available.

CASE is evolving in the workplace, as organizations adopt CASE tools to real-world uses and as users experiment and become more familiar with their features. Vendors may someday fulfill their dreams of a CASE package on every system, but for now most organizations sample a few features from the smorgasbord of CASE options and leave others alone.

Mary C. Jones is an assistant professor of management and Miss. Kirk P. Arnett is an associate professor of MIS at Mississippi State University.

Prototyping With CASE Is Big

Prototype Builders Using CASE Tools



Prototype Builders Not Using CASE

Source: Jones and Arnett

It's A Recovery... Er, Sort Of

The DATAMATION Information Systems Performance Indicator (ISPI) began to hoist itself out of its hole this past winter. The indicator rose steadily—from 92.6 in September 1991 to 96.1 in January 1992. Last month the ISPI just nudged the 100 mark; it will most likely head toward 105 by October. But the risks of another decline still exist: the ISPI inched upward at the start of 1991 too, but then faltered as the long economic slowdown turned to recession. Although our forecast for the information technology (IT) industries shows solid growth for this year, the potential for a 1991-style repeat recession exists.

Over the past few months, the computer industry stock price index—one of the series comprising the ISPI—reeled more often than not. But on the upside, and more significant to long-term economic health, new orders received by U.S. IS manufacturers increased. On a seasonally adjusted basis, monthly new orders increased from \$8.85 billion in August 1991 to \$10.14 billion in January 1992.

On the downside, order backlogs still dwindled, meaning IT manufacturers' shipments are exceeding orders. At the same time, inventories increased for the first time in January, up by a modest 2%, compared with an annual decline of 4.8% for all of 1991.

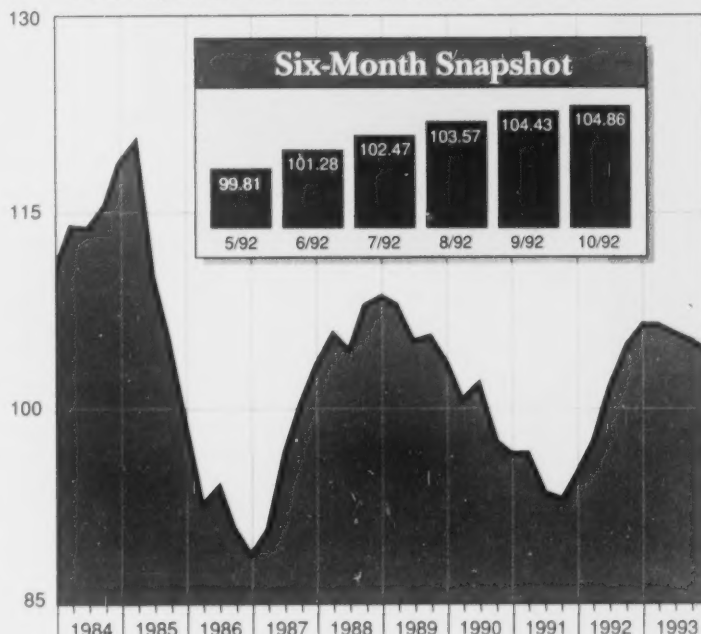
Despite all of these conflicting economic signals, U.S. businesses have renewed their purchases of computer, peripheral and communication equipment. The turnaround in domestic investment is the IT industry's best hope for a sustained recovery now. ■

By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services call Dan Buchan at (617)-630-2105.

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The IS Performance Indicator

If You Truly Believe The Numbers, Recovery For IT Is Already Here



*Shaded area denotes forecast

	Jan. 1992	Dec. 1991	% Change 1/92-12/91	Jan. 1991	% Change 1991/1992
■ Information-Processing Equipment					
Shipments (SA, \$ billions)	10.45	9.64	8.3	9.81	6.5
New Orders (SA, \$ billions)	10.14	9.67	4.9	9.42	7.6
Unfilled Orders (SA, \$ billions)	25.45	25.77	-1.3	28.52	-10.8
Inventory (SA, \$ billions)	15.33	15.04	2.0	16.11	-4.8
■ Computer Production Workers					
Employment (NSA, thousands)	252.3	255.0	-1.1	271.0	-6.9
Average Weekly Hours (monthly avg.)	41.4	43.1	-3.9	41.0	1.0
■ Stock Index					
S&P's Computer Systems Stock Price Index	160.6	161.2	-0.3	211.3	-24.0
■ Contracts & Orders					
New Plant & Equipment (SA, \$ billions)	32.1	37.6	-14.5	42.3	-24.0

SA= seasonally adjusted;
NSA= not seasonally adjusted

Source: U.S. Commerce Dept., Standard & Poor's, forecasts: Cahners Economics

Source: Cahners Economics

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DATA MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

MAY 15, 1992

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OVER 125
486-BASED PCs

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Kamran Kheirulomoom,
CEO, ViewStar Corp.,
with ViewStar, release 3.0

DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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Tiny ViewStar has made its mark selling image management software to *Fortune* 500 firms. Now, as its software grows more powerful, ViewStar is growing with it.

SPECIAL REPORT

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The dream of extending mainframe storage management services to data stored on distributed PCs, workstations and LANs is about to become a reality.

PRODUCT GUIDE

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Seer Technologies Inc.'s new High Productivity Systems (HPS) computer-aided software-engineering tool promises much and guarantees delivery.

88 Getting The Message

To make the world a little safer for electronic communications, Digital Equipment Corp. has added new ULTRIX client software to its Reliable Transaction Router global-messaging system.

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Processor power is going up; prices are coming down. That's music to the ears of IS managers.

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Running out of memory on your X terminals? Here are several proven techniques for avoiding terminal collapse.



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SPECIAL REPORT: Data backup may be mundane, but it's as critical as ever, page 36.



PRODUCT GUIDE: Seer's Wadhwa stands behind his product, page 87.

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Vendors are pushing SQL access to nonrelational databases, but users say the drawbacks are significant.

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Move over, Mister Natural: Software AG's new Entire Function Server products help users make client/server more than hype in their shops.

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The law says your information system must be accessible to employees with disabilities. No problem.

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ECONOMIC TRENDS

Is It Big Bucks Time For IS?

Will U.S. businesses finally break out of their recessionary mind-set and start spending some cold hard cash on new equipment next year? Maybe—but not without good reason. Recently released data from an industrywide information systems spending survey administered by CSC Index Inc., a subsidiary of Computer Sciences Corp., indicates that computer equipment buyers in at least some sectors of the U.S. economy may finally be able to pull out their checkbooks this year.

CSC polled 444 large North American organizations in a variety of industries late last year. The firm recently made the data public. In the report, CSC estimates that, on average, overall IS budgets will increase by 3.5% this year. But that's just the average number; certain industries—media/entertainment, pharmaceutical/medical products, transportation services and consumer products—are projecting spending increases of 7% or greater. When you measure planned IS spending as a share of corporate revenue, the top spenders will be telecommunications, aerospace, insurance and computers/electronics.

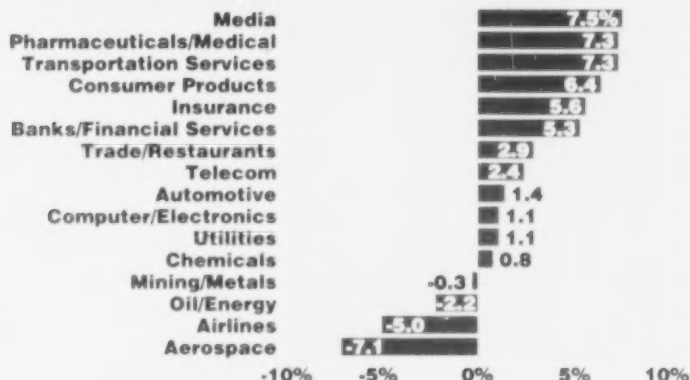
Order processing/handling, information systems development and post-sale customer service were cited most as the preferred areas of information technology investment in 1992.

CSC's data on 1992 IS spending complements a combined DATAMATION and Business Research Group (BRG) poll carried out last year of 150 IS managers, directors and vice presidents. Results were published in the January 1, 1992, issue of DATAMATION. That study found that 34% of IS managers expect IS expenditures to rise this year, while only 16% anticipate having to reduce spending levels below those of 1991.

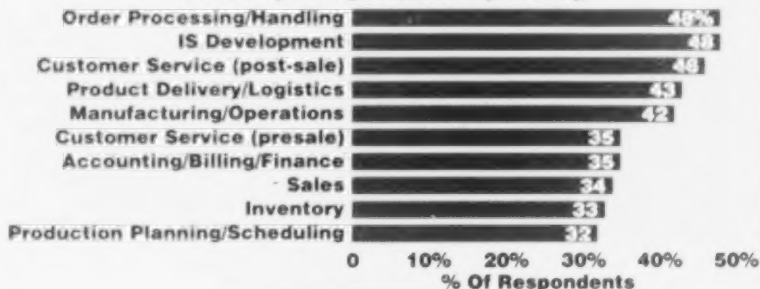
By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, contact Dan Buchan at (617)-630-2105.

How IS Spending Will Change This Year

1992 IS Spending Increase/Decrease By Industry



1992 IS Spending Priorities By Activity



Source: CSC Index Inc.

The Economy At A Glance

U.S. Economy: Macroeconomic And Industrial Indicators

	Actual		Forecast (Annual % Change)		
	Q3 91	Q4 91	1991	1992	1993
Gross National Product	1.8	0.8	-0.7	2.0	3.2
Business Investment In Equipment	6.7	-3.7	-3.5	3.2	4.0
Government Spending	3.4	-5.4	0.9	2.5	2.4
Consumer Spending	2.3	-0.2	-0.1	1.7	2.9
Exports	7.3	13.1	6.6	7.1	3.8
Imports	22.3	2.5	0.3	4.3	2.4

All calculations are % change in 1987 dollars; quarterly figures are seasonally adjusted annual rates

	Jan. 1992	Dec. 1991	% Change 1.92-12.91	Jan. 1992	% Change 1992-1991
Manufacturing Production (1)					
Process Industries Total	107.9	107.8	0.1	105.7	2.1
Chemicals	113.6	113.2	0.4	110.1	3.2
Petroleum	107.8	109.3	-1.4	104.7	3.0
OEM Total	107.2	109.1	-1.7	109.3	-1.9
Computers & Peripherals	160.5	159.1	0.9	155.0	3.5
Communications Equipment	112.1	112.6	-0.4	108.4	3.4
Transportation Equipment	93.6	98.1	-4.6	97.6	-4.1
Services Employment (2)					
Finance, Insurance, Real Estate	6.635	6.683	-0.7	6.678	-0.6
Health Care	8.427	8.431	-0.1	8.040	4.8
Computer & Data Processing	0.859	0.860	0.0	0.811	5.9
Transportation/Utilities	5.737	5.866	-2.2	5.802	-1.1
Retail Trade	18.950	19.820	-4.4	19.323	-1.9
Wholesale Trade	5.955	6.029	-1.2	6.086	-2.2
Government	18.471	18.811	-1.8	18.333	0.8

(1) Index 1978=100; seasonally adjusted

(2) Millions of persons; not seasonally adjusted

Source: Commerce Dept. and Cahners Economics

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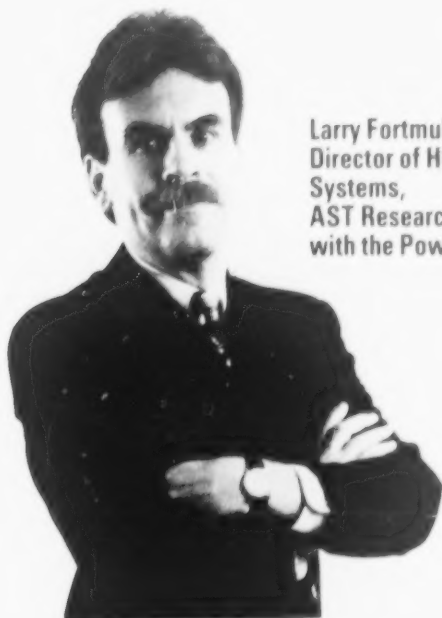
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DATA[®]MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

JUNE 1, 1992



Larry Fortmuller,
Director of High Performance
Systems,
AST Research Inc.,
with the Power Premium



AST Fields A Windows Machine

page 22

New Video Boards Make Windows Fly

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Operating Systems Take Pen In Hand

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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22 AST Fields A Windows Machine

These thoroughbreds from AST were born to run Windows at breakneck speeds.



31 New Video Boards Make Windows Fly

Windows's success is giving rise to a variety of products for improving its performance on 286, 386 and even 486 PCs.

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Stoke the fires, full speed ahead for the 15th annual DATAMATION/Cowen & Co. survey of mainframe and midrange purchasers' buying intentions—broken down in abundant, useful detail.

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57 Operating Systems Take Pen In Hand

Applications, that's the point of pen-based computing. But choosing an operating system comes first.



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Building Up Steam For '93

What happens when you merge one of the country's foremost technology investment brokerage houses, a hotel full of institutional investors, a multitude of high-tech execs and more than 2,000 DATAMATION readers? You get the 15th annual DATAMATION/Cowen & Co. survey of main-frame and midrange purchasers' buying intentions—broken down in abundant, useful detail.

For three days this spring, DATAMATION and Cowen & Co. took over San Francisco's Ritz Carlton to unveil to institutional investors and dozens of supplier company representatives the state of the computing industry today—and the promise of emerging technologies tomorrow.

On the following pages, we reveal the state of your IS compatriots' wallets. We uncover how they're spending this year's more frugal budgets and where they're saving. We uncloak the promises that are fizzling and those still gaining strength. And, in related articles, we examine four emerging technologies—massively parallel processors, pen-based computers, object-oriented programming and smart network hubs—that excited a lot of interest among both Cowen's eager investment audience and DATAMATION's IS readers.

BY DWIGHT B. DAVIS

SPECIAL REPORT

INDUSTRY FORECAST

One year ago, corporate information systems skippers anticipated a rising economic sea that would lift their budgetary vessels out of a recessionary trough. Instead, the ebb tide persisted, causing already-depressed spending growth rates to sink even fur-

ther. Still, various computing sectors and companies have managed to swim against the tide, and many industry participants see a broad-based flood of IS purchases building on the horizon.

So says the 15th annual DATAMATION/Cowen & Co. survey of mainframe and midrange computer users.

In aggregate, the 2,321 survey respondents indicate that, because of spending restraints, their computer operations are not keeping up with their users' needs. Once money begins to flow more freely, this pent-up demand could cause a strong resurgence of hardware and software spending, speculates Steve Weber, managing director of Cowen & Co. in Boston. "Budgets look like they could take off in 1993," he says, while cautioning that many users remain pessimistic.

In fact, because of the recession, more than one-fourth of the survey respondents have deferred or canceled major planned hardware procurements. And total IS budgets are projected to grow only 6% annually over the next three to five years. While that may sound high compared with other corporate budgets, it's down significantly from previous years. Even in last year's uncertain economic climate, Cowen survey respondents expected their IS budgets to grow 7.5%.

Meanwhile, everyone's processing and storage capacity needs continue to grow relatively unchecked. On average, these capacity demands are doubling about every 3.5 years, the source of the pent-up demand. Of those who put off major hardware purchases, more than one-third expect to reinstate procurements in 1993 or later, and a quarter expect to reinstate them as soon as this year. Overall, 41% expect to spend somewhat or considerably more on hardware in 1993 than they will this year.

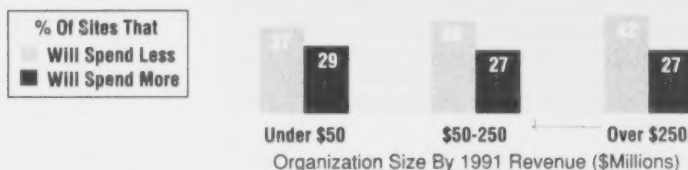
Given these dynamics, financially strapped IS executives find themselves wrestling with two fundamental options. On the one hand, they can embrace new technologies and computing architectures that promise better price/performance than their traditional mainframe host computers. Users can shift mainframe applications to midrange departmental systems or to desktop PCs and workstations, for instance. Additionally, in something of a compromise approach, IS chiefs can implement network-based client/server computing, in which data and applications that once resided solely on the mainframe are partly distributed to departmental and desktop computers.

On the other hand, IS chiefs can stick

Budgets Soft, But Demand Grows For 1993

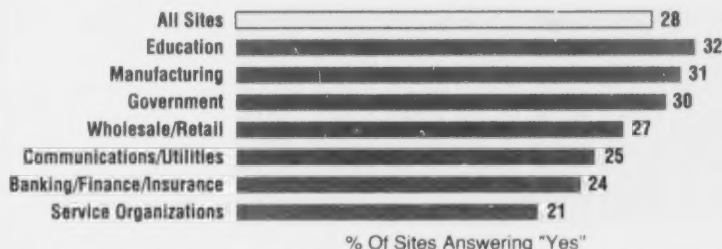
RESPONDENTS WERE PESSIMISTIC ABOUT 1992 HARDWARE SPENDING.

How will the dollar value of hardware (CPUs, peripherals and PCs) to be acquired by your organization in 1992 compare with that of 1991?



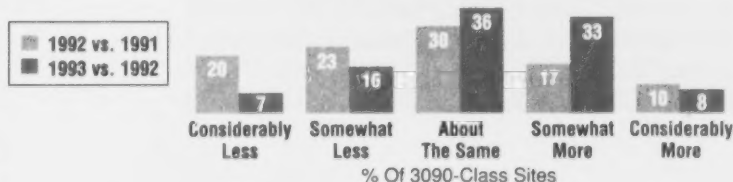
MORE THAN ONE-FOURTH OF REpondENTS DEFERRED OR CANCELED MAJOR HARDWARE ACQUISITIONS IN 1992...

Has your organization deferred or canceled any major planned hardware procurement(s) because of the recession?



BUT RESPONDENTS ARE CONSIDERABLY MORE OPTIMISTIC ABOUT 1993 BUDGETS.

How do you expect your 1993 hardware-spending budget to compare with 1992's?



OVER THE LONG TERM, HOWEVER, RESPONDENTS INDICATED HARDWARE BUDGETS WILL CONTINUE THEIR DECLINE, OSTENSIBLY DUE TO ECONOMIC UNCERTAINTY.

At what average annual percentage rate will your DP hardware budget increase over the next three to five years?

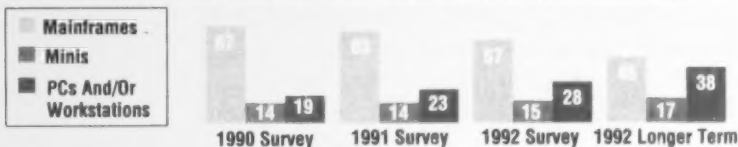


Source: DATAMATION, Cowen & Co.

Where Applications Are Going

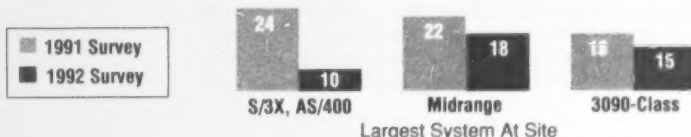
NEW APPLICATIONS ARE RAPIDLY MOVING AWAY FROM BIG IRON.

Percentage of new applications to be implemented on various types of computers over the next one to two years, and in the longer term (308X/3090-class sites)



HOWEVER, RESPONDENTS ARE NOW LESS INCLINED TO MOVE EXISTING APPLICATIONS OFF THE MAINFRAME.

What percentage of your current applications will move to PCs and LANs in 1 to 2 years?



Source: DATAMATION, Cowen & Co.

with what they know best: maintaining a focus on mainframe-oriented facilities. Bearing these dilemmas in mind, IBM and other mainframe vendors are struggling to maintain their bases of existing users by offering new generations of large processors and improved data storage subsystems, all featuring better price/performance, increased data capacity and greater functionality.

On balance, the limited IS funds currently available help prolong the status quo, at least in the short term. Major computing overhauls require major investments; even though smaller machines and networks promise cost savings over time, it's tough for managers to spend large sums today against future, theoretical paybacks.

In fact, users of large, IBM 3090-class mainframes estimate that they will move only 15% of their current mainframe applications to networks or personal computers during the next two years. Last year, with greater budget growth anticipated, 18% of these respondents expected such an application migration.

But in the long term, despite the slowdown in off-loading mainframe applications, the survey data indicate that the mainframe's importance will continue to erode gradually. For the first time in the survey's history, respondents predict that they will imple-

ment less than half of their new applications on mainframes over the long haul.

Over the next two years, respondents project 57% of new applications will be implemented on mainframe computers. That's down from 63% a year ago. And when asked about the long term, that number drops to 45%. At

the same time, respondents anticipate putting more and more applications on PCs and workstations, and, to a lesser extent, on minicomputers. "While the data indicate a long-term trend away from mainframes, they are not by any means being swept away rapidly," concludes Cowen's Weber.

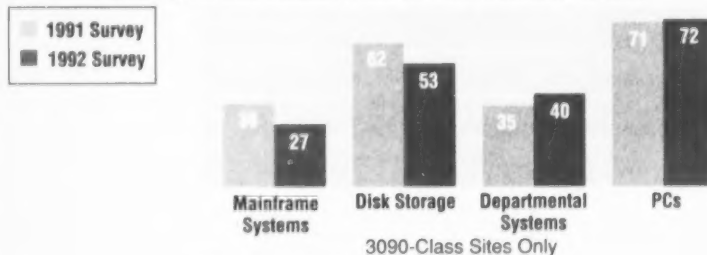
Nevertheless, the short-term future for major new mainframe investments may be bleak. Among users of the 3090-class machines, just 27% indicate a need for more mainframe system capacity for the 1992-1993 period. This represents a 9 percentage point drop in perceived need from a year ago.

These figures don't necessarily translate into total doom and gloom for IBM and its competitors. Indeed, the top end of IBM's System/390 ES/9000 line (machines with list prices of about \$16 million to \$23 million) "is doing very, very well," says Nick Donofrio, vice president and general manager of IBM's Enterprise Systems division. "We sold out our high-end computers in the first quarter, and we're working on satisfying our backlog worldwide," he says. This situation isn't surprising, according to Cowen's Weber, who says there is almost always demand for maximum

Who Needs More Capacity?

ALTHOUGH CAPACITY NEEDS ARE UP FOR PCs AND MIDRANGE SYSTEMS, THEY'RE MORE SUBDUED FOR MAINFRAMES AND DISK STORAGE...

Percentage of sites indicating need for more processing capacity



3090-Class Sites Only

YET MAINFRAME CAPACITY NEEDS ARE DOUBLING, ON AVERAGE, ABOUT 3.5 YEARS.

At what average annual rate do you expect your capacity needs to increase over the next three to five years?



Source: DATAMATION, Cowen & Co.

capacity machines even during periods when demand for entry-level mainframes falls off.

Still, even given the popularity of these maximum capacity mainframes, "Our view for 1992 [for the Enterprise Systems division] remains quite modest," Donofrio admits. "We're working hard to improve cost expenses as well as return on assets."

IBM also needs to work hard to improve its image among large-systems users, the survey indicates. When asked if their attitude toward IBM as a supplier had changed during the past year, 27% of the 3090-class respondents said their opinion of the company was less favorable, and only 11% said their attitude became more favorable. One year ago, just 18% reported a less favorable attitude toward IBM, and

The limited IS funds currently available help prolong the status quo.

19% reported a more favorable opinion.

Despite this troubling shift, IBM is proving adept at warding off competition for its existing mainframe accounts. Among the large-system respondents, 83.8% list IBM as their primary supplier of host systems. Almost

80% of these users say IBM will remain as their main supplier in the future—a drop, but not a precipitous one.

Sunnyvale, Calif.-based Amdahl Corp. and Santa Clara-based Hitachi Data Systems Corp., the two major suppliers of plug-compatible mainframes, stand to gain some, but not all, of IBM's projected slight drop in business. Making even greater inroads into IBM's accounts will be Maynard, Mass.-based Digital Equipment Corp. and Hewlett-Packard Co. of Palo Alto. Even so, respondents indicate that in the future these two companies—traditionally considered midrange suppliers—will be the primary host system suppliers for just 3.7% and 1.8% of the IBM and PCM large-system base.

The survey also indicates that user demand for the "open" UNIX operating system remains a fairly minor issue, at least as a mainframe alternative. Only 13% of the respondents say that UNIX capability for their mainframes is "very desirable." IBM's proprietary MVS operating system seems solidly entrenched and has essentially become a de facto open system, argues Cowen's Weber.

UNIX demand is much stronger at the department level, however. More than one-quarter of the respondents say UNIX is a "very desirable" capability for their departmental systems. This department level demand for UNIX represents "the soft underbelly" of IBM's account control, Weber says.

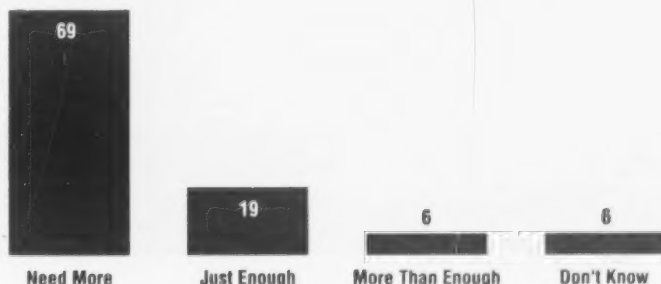
Well positioned to capitalize on IBM's UNIX vulnerability in this sector are HP and Sun Microsystems Inc., the survey reveals. Among the sites planning to emphasize UNIX for their departmental systems in the future, 11.7% expect HP to be their primary source of equipment. At present, HP is the main supplier for just 7.5% of the respondents. Mountain View, Calif.-based Sun, meanwhile, is projected to be the primary future supplier for 6.7% of these users, up from its current base of 3.3%. At the same time, IBM's role as the primary departmental UNIX supplier slips from 52.5% to 44.2%.

As is the case in the departmental-computing marketplace, UNIX shops pose the greatest problem for IBM (as well as Digital) in the healthy on-line transaction-processing (OLTP) arena. A

And So The PC Market Grows

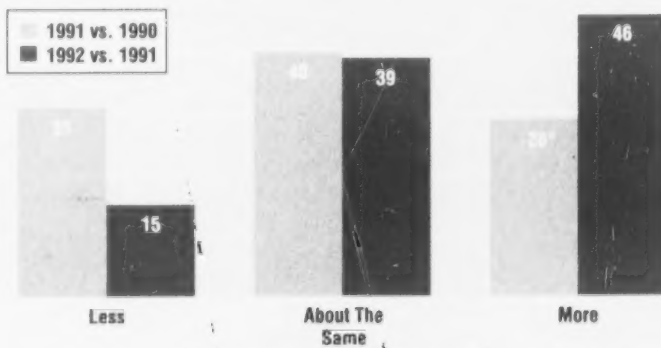
BECAUSE MORE THAN TWO-THIRDS OF RESPONDENTS NEED MORE PC CAPABILITIES...

How well set is your organization in terms of installed capacity for its 1992-1993 PC processing needs?



THE PC PURCHASING OUTLOOK SHOULD IMPROVE IN 1992.

How will the number of PCs your organization procures this year compare with the number purchased last year?



*Total does not add up to 100% due to rounding

Source: DATAMATION, Cowen & Co.

large percentage of software applications will be devoted to OLTP in both UNIX and, especially, non-UNIX shops. From 85 to 92% of those surveyed already run OLTP systems, but these high penetrations do not preclude substantial OLTP growth. On average, users predict that the number of transactions processed per day will grow 18% each year for the next five years.

IBM supplies more than half of all OLTP systems currently in use at the survey respondents' sites, and the computer giant should retain its majority grip despite some slippage in the future. Digital and HP trail at a distant second and third, respectively. Stratus Computer Inc., a Marlborough, Mass., maker of fault-tolerant computer systems, and Sequent Computer Systems Inc., a manufacturer of symmetric-multiprocessing computers in Beaverton, Ore., show the most growth potential in the OLTP sector overall, although their total market shares will remain

The longer the backlog, the larger the anticipated growth of software spending.

tiny compared with those of the top three suppliers.

However, in those shops that expect to run their OLTP applications on UNIX machines, the survey shows IBM's grip on OLTP loosening. IBM currently holds just 43.6% of the OLTP base among the

sites planning to move to UNIX-based OLTP, and respondents expect it to be the primary supplier at only 28.9% of these sites in the future. Digital's future share of these sites, meanwhile, is also projected to plummet—to 12.2%, down from its current 20.4% stake. The downturn predicted for both IBM and Digital is probably due to a lack of UNIX-based OLTP products, says Cowen's Weber.

HP and Sequent stand poised to take up much of the slack in UNIX OLTP environments. HP holds just 7.8% of the current base in this sector, but is expected to account for 18.9% in the future. For its part, Sequent is projected to parlay its 1.0% market presence into a 7.8% share, respondents predict.

In the past, OLTP applications resided solely on mainframe computers. Although this centralized computing paradigm remains dominant in large companies, the client/server model continues to make solid gains. Twenty-nine percent of respondents have already begun implementing client/server computing. An additional 11% are running pilot programs, and 23% are seriously considering the client/server option.

Among larger companies—those with 1991 revenues exceeding \$250 million—the trend toward client/server computing is even more dramatic. Thirty-six percent of these large users are running client/server applications, and 15% are in the pilot stage.

Two necessary components of client/server installations are networks and PCs, and the spending rates in both of these sectors remain strong. While the overall annual growth rate expected for total IS budgets dropped to 6.0% this year, anticipated budget growth for network procurements held at a steady 9.2% rate. Even though fully 71% of the respondents have already installed departmental networks, there remains room for growth. Only 41% of the respondents' corporate PCs are currently connected to networks, and that figure is expected to grow to 55% by year's end.

Sitewide and enterprisewide networks, by contrast, appear less frequently than do their departmental siblings. Only 40% of the respondents

Networks: Quite A Head Of Steam

NETWORK SPENDING DRAMATICALLY OUTPACES AVERAGE IS BUDGET GROWTH...

Average annual expected increase in total hardware and network budgets in 3-5 years



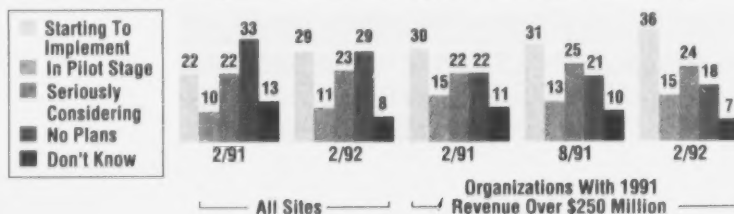
WITH LARGE ORGANIZATIONS LEADING THE WAY...

Percentage of respondents who have installed various types of networks



THE LARGEST ORGANIZATIONS LEAD THE ACCELERATING TREND TOWARD CLIENT/SERVER COMPUTING.

Where does your organization stand with regard to client/server computing?



Source: DATAMATION, Cowen & Co.

have a sitewide network, and only 31% have tackled the job of networking their entire organization.

All told, a growing number of users are turning to networked PCs and/or workstations as the main vehicles for implementing their future computing

strategies. Depending on the organizations' size, anywhere from 26 to 35% of the surveyed users indicate they'll use networked PCs/workstations as their principal hardware platform for future data-processing applications. Even more impressive, between 50 and 68%

of the users—again rising with organization size—plan to use networked desktop computers as their primary hardware for office/productivity applications.

That growing cadre of users is relying heavily on NetWare, Novell Inc.'s network operating system. Where once it was primarily used for departments' local area networks, the Provo, Utah-based company's flagship product is now just as pervasive in sitewide and organizationwide networks. Impressively, roughly two-thirds of respondents across all three sectors plan to use NetWare in 1992 and 1993; growth is most dramatic in enterprise-wide networks, where it will jump from 57% to 66% next year and beyond.

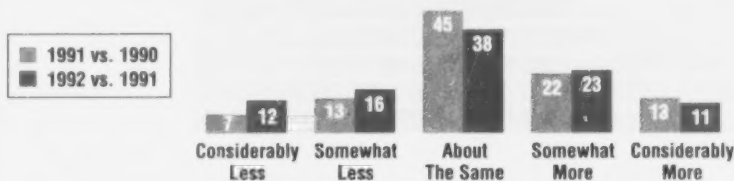
Within the PC sector, the battle for operating system hearts and minds is about to get more complex, as IBM's long-delayed OS/2 2.0 PC operating system makes its appearance at last and girds itself to fight with Microsoft Corp.'s formidable DOS/Windows environment. In its campaign, IBM will face a steep uphill climb. Respondents indicate that almost half of their future operating system platform use will be Microsoft's basic DOS product. DOS-based Windows and the still-under-development Windows NT will fulfill 31% of their operating system needs. By contrast, respondents plan on only 10% use of OS/2, which represents a 6 percentage point drop from expected use one year ago.

In OS/2's defense, Cowen's Weber speculates that the operating system's poor showing this year might have been influenced by the software's delayed entry into the market. Originally scheduled to be available late last year, the initial OS/2 shipments did not finally get under way until the end of March. IBM, predictably, is in no mood to accept the survey's bleak prognosis. Lucy Baney, director of programming systems market development for IBM's Personal Systems division, points out that OS/2 2.0 is in 30,000 beta test locations. What's more, she says, about 1,000 independent software vendors should produce 1,200 32-bit OS/2 applications by year's end. Delays aside, she maintains, "there are no more questions about the technical superiority of

Software Spending Slackens

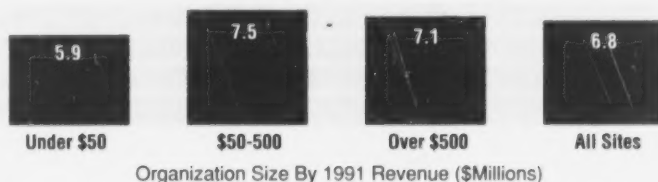
SOFTWARE SPENDING IS DOWN COMPARED WITH 1991 LEVELS...

How will the dollar value of software acquired by your organization this year compare with last year?



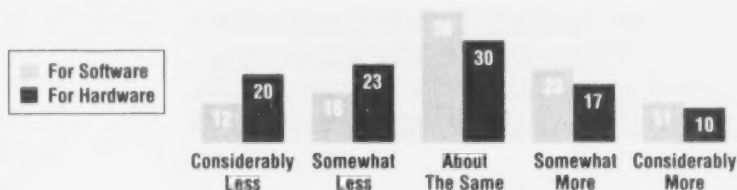
AS BUDGET GROWTH SITS IN MID-TO-HIGH SINGLE DIGITS ACROSS ALL SIZES OF ORGANIZATIONS.

Average annual expected increase in software budgets over the next three to five years



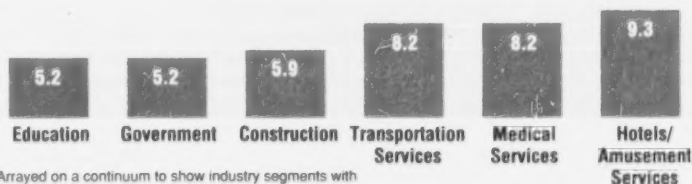
BUT PLANNED SOFTWARE SPENDING STILL LOOKS BETTER THAN HARDWARE SPENDING...

How will the dollar value of hardware (CPUs, peripherals and PCs) and software to be acquired by your organization in 1992 compare with that of 1991?



AND THE SERVICE SECTOR WILL FUEL MUCH OF THE GROWTH IN SOFTWARE.

Average annual expected increase in software budgets over the next three to five years*



*Arrayed on a continuum to show industry segments with lowest and highest rates of growth

Source: DATAMATION, Cowen & Co.

An Object Lesson In Programming

OS/2." Furthermore, she predicts that over the next three to four years, IBM will ship OS/2 in numbers equal to or greater than Microsoft's Windows and the future Windows NT software. In January, Microsoft claimed it had shipped 9 million copies of Windows.

Whether or not OS/2 meets Baney's upbeat projection, IBM is already showing some weakness in various other software sectors. This is particularly significant since software budgets are generally growing at faster rates than their hardware counterparts. A key reason for this faster growth is ever-present backlogs for new applications. Three-quarters of 3090-class main-frame users report that their current applications backlog will take more than one year to program; 36% say their backlog stretches out more than two years.

The longer the backlog, the larger the anticipated growth of software spending. At sites with application backlogs exceeding two years, respondents anticipate a 7.8% average annual increase in software expenditures over the next three to five years. By comparison, the expected growth in annual software budgets is just 6.1% at sites with backlogs that can be addressed within one year. The projected hardware budget growth at these two types of sites is just 6.2% and 5.7%, respectively.

As logic would have it, long applications backlogs are causing more users to shift from developing their own applications to the more expedient solution of buying packaged software. In 1991, survey respondents indicated that in-house staff would develop 63% of their applications, and that they would purchase only 26% as packages. This year, 58% say they will rely upon in-house programmers, compared with 32% who plan to buy packaged software. (The balance of applications are provided by third-party service companies.) Packaged software accounts for 11% of the average data-processing budget.

IBM's share of the packaged software market is declining even as more users are turning to such software. A decade ago, two-thirds of the dollars spent for packaged software went to IBM. This year, that percentage drops below 50%

One phrase that seems to be on everyone's lips these days is "object-oriented programming," a methodology that has the potential to fundamentally change the way software manufacturers develop products.

So what is this object stuff, and why should you care about it?

Objects are self-contained modules of data and the programs that act on those data. An object might be, for example, an individual invoice in an order-processing system. "Object-oriented programming is certainly not a product. It's a technology," says Gordon Eubanks, president of Symantec Corp., a Cupertino, Calif., software developer deeply involved in object-oriented research.

The typical office worker doesn't care how programs are constructed, Eubanks points out. However, using object-oriented programming techniques can affect the type of product a software developer turns out in much the same way a manufacturing process affects the quality of goods produced by, say, soap or automobile manufacturers. It also has the potential to greatly speed up product development.

According to David Liddle, president of Palo Alto-based Interval Research Corp. and formerly IBM's vice president of new systems and



■ Interval's Liddle: Object-oriented technology helps companies "get off the sandbar."

business development, object-oriented programming techniques have several benefits. They produce modules of code—little bulletproof components of a program that don't interact with each other—rather than traditional, sequential programs. This modularity simplifies design because components can be reused. It makes finding errors easier because developers don't have to hunt through the entire program to track down a bug. Both of those factors can help speed products to market.

"The reason that object-oriented architectures are better than previous approaches that we've tried is extremely technical and may be arcane, but the end result is, I think, easy for people to comprehend," says Eubanks. "If you can build building blocks in software and then reuse them, you should be able to get more leverage in producing more sophisticated and detailed products for software programs."

Liddle says that object-oriented technologies are a new way to help companies make the arduous move from product design to market—a process he calls "getting off the sandbar."

"We want to be able to sell into a market and to distribute software in more markets and in more different ways than we can do it today," says Liddle. And that can only help the software industry.

—Elizabeth Lindholm

for the first time.

Even in view of the trend toward packaged software, the bulk of the applications software used by large organizations is still created in house. So, anything that can boost the productivity of the staff programmers and the quality of their output will receive more than its share of budget allocations in the coming years. For example, the percentage of mainframe users employing computer-aided software-engineering (CASE) tools grew from 11% in 1991 to 14% early this year, and respondents project that this percentage will grow to 22% by the end of 1992.

The percentage of the total software budget devoted to CASE will rise in coming years, for those already using CASE products. Indeed, according to 435 respondents who answered a separate survey sent to 1,632 users of CASE and other productivity-enhancing tools, just 6.3% of software dollars went to CASE and similar products in 1991. But these respondents estimate

that percentage will grow to 8.6% this year and to 10.1% in 1993. Overall, these existing users on average expect budgets devoted to CASE and other application development tools, such as fourth-generation languages (4GLs), to



increase at 27% per year over the next three to five years.

Spending for software development tools is growing in companies that need them primarily for developing mainframe applications. But demand is strongest at sites using the tools to develop applications for workstations. For instance, this year, respondents at these workstation sites project that 15% of their software budgets will be spent on CASE tools and similar products, whereas only 7% of the software budget will be allocated to these products at the mainframe sites.

Even at workstation sites, however, only 28% of potential users currently employ CASE and other productivity-enhancing tools. At sites of all types already using these tools, penetration is just 19%, indicating a promising growth potential for CASE tools, 4GLs, object-oriented programming languages and other such software development products within existing sites.

These tools include a broad spectrum of products that address various components of the software life cycle from the initial analysis to the final maintenance. Analysis and design tools are relatively well accepted; about one-third of these CASE-oriented respondents currently employ them. Here,

Oracle Corp. is emerging as a leader, showing signs of strong growth. At the time of the survey, the Redwood Shores, Calif., company was the supplier of analysis and design tools at just 11% of the responding sites, but 20% of respondents list Oracle as their likely supplier in 1992-1993.

Fourth-generation languages, too, are well established; about 45% of respondents already use them. Oracle also fares well in this sector, holding the largest market share—19%—of the installed base. Twenty-one percent of those surveyed say Oracle will be their future supplier, further solidifying its lead. Among other vendors, Sybase Inc. shows the strongest growth potential. The company holds just 5% of the installed base of these tools, but 9% of respondents list the company as their future supplier.

Once users produce software code, they must maintain and update it. Most are still performing maintenance manually; less than 10% employ maintenance and reengineering tools. These tools could take off over this year and next, as users add to their skimpy base; respondents predict a 71% growth rate through 1993. Use of tools for maintenance is matched by use of tools to create expert systems. Respondents indicate that use of these tools will expand 57% through 1993—a growth rate equaled by that of real-time system and technical CASE tools, which only 7% of the respondents use currently. Cross life cycle CASE tools, which help manage the overall application development process, promise to grow 74% through 1993, from an almost nonexistent base of 3% or 4%.

The optimistic growth rates indicated for many types of CASE tools are only a few bright spots in the weak 1992 market for hardware and software, however. IBM and other vendors can only hope that current budget projections prove unduly pessimistic. Still, demand for processing is growing at a healthy clip, so it stands to reason that budgets are bound to surge at some point. The outstanding question now is whether the anticipated budget resurgence will occur during 1993, or whether information systems suppliers will have even longer to wait for their ships to come in. ■

Survey Method

The 15th annual Large and Midrange Systems User Survey is based on 2,383 reader survey questionnaires returned last February following a mailing to 55,000 IBM mainframe users and 1,905 supercomputer users in the United States and Canada. Statistics concerning computer-aided software engineering (CASE) are based on 435 questionnaires returned following a separate mailing to 1,632 users of CASE software.

The survey is administered by Cowen & Co. Institutional Services, a full-service brokerage and corporate finance company whose Boston and New York-based research team specializes in high technology and health-care related companies. Although the survey does not constitute a scientific representative sampling of the domestic user community, the results do highlight general directions toward which IS managers are moving their organizations in the year ahead.

Top Accountants Rate Accounting Software

If the leading micro- and LAN-based accounting packages all look the same to you, look closer—their differences are small but important.

Gotta pick accounting software for the LAN? Cinch. Stick with the top-selling packages, and how can you go wrong? After all, they'll all post to a general ledger, pay vendors, invoice customers and spit forth financial statements, pleasant or otherwise. And the

BY NED SNELL

name brands are mature and stable products that by now must all feature the same bell-and-whistle set, right?

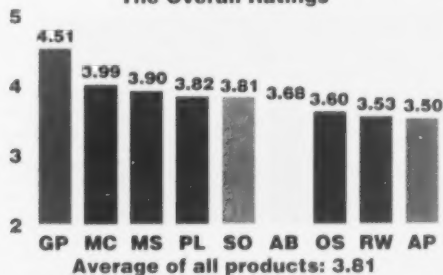
Experts in accounting software say this point of view is pervasive—and

dead wrong. Selecting accounting software is tricky business, demanding plenty of time and careful research—even for the relatively inexpensive PC-based packages available that run on local area networks (LANs).

Since PC packages only cost about

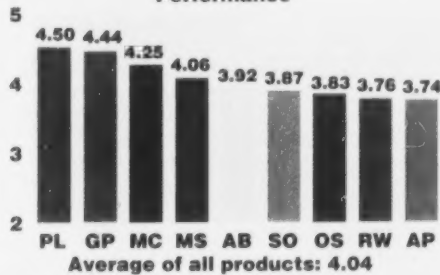
Accountants Rate Accounting Software:

The Overall Ratings



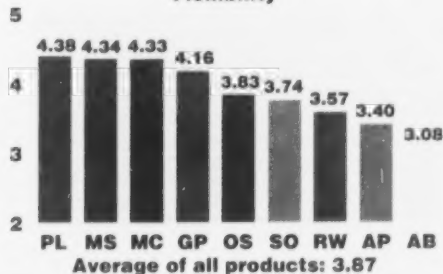
OVERALL RATINGS: Average of performance, stability, flexibility, ease of use and vendor support ratings.

Performance



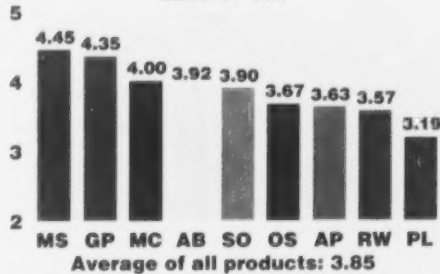
PERFORMANCE: Speed of menu and screen changes, file updates, report generation etc.

Flexibility



FLEXIBILITY: The system's adaptability to specialized needs through built-in customization features, report writers, file import/export utilities and modifications to source code.

Ease Of Use



EASE OF USE: The ease of installing, learning and using the package; the ability of the end user to use and maintain the system without requiring a high degree of ongoing support.

Legend:

AP = ACCPAC PLUS GP = Great Plains MC = MACOLA MS = MAS 90
OS = Open Systems PL = Platinum RW = Real World SO = Solomon III
Ratings Scale: 1 = Poor 3 = Fair 5 = Best

Source: CTS

SOFTWARE

APPLICATIONS

\$150 to \$700 per user, "it's difficult for a client to see why he should pay for advice," says CPA Jim Snyder, a partner of Boulay, Heutmaker, Zibell & Co. in Edina, Minn. "But the impact on his business has got to be considered. He's probably going to be months down the road before he realizes he's got the wrong fit." As more companies begin to port critical applications like accounting down to today's big LANs, the price of a bad decision—including lost productivity and the cost of migrating to and retraining for a replacement accounting package—grows.

Snyder says some firms are even willing to let their hardware vendor recommend an accounting package—a potentially disastrous decision. "A good hardware person may not know a debit from a credit or an income statement from a balance sheet," he says.

So where can accounting software buyers go for answers? According to CPA Ron Bernstein, senior associate with Coopers & Lybrand in New York City, you're already doing one thing right: you're reading about PC accounting software in a professional computing publication.

Of course, he's quick to point out that you can also hire professionals like himself or Snyder, accounting experts who can work with your chief financial officer or comptroller and IS staff to develop a comprehensive business/technical needs analysis, then identify a "short list" of packages that most closely match both the company's immediate needs and its likely direction. But you've got to be sure to evaluate these products in house and, if possible, use a copy of your company's actual accounting data, Bernstein says, before ac-

counts payable cuts a check to the winning software vendor.

A good start on the road to locating potential software vendors may be three products from Computer Training Services Inc., of Rockville, Md. CTS publishes an annual survey of microcomputer accounting product evaluations; a 250-page guide to selecting accounting software; and a Lotus 1-2-3 template (see sidebar, "A Do-It-Yourself Software-Rating System"), which automates your own product evaluation.

The 1992 survey, the company's fifth annual, presents scores and comments from 160 CPAs and consultants who install and recommend accounting software. They rate nine of the leading MS-DOS-based integrated accounting packages; the results are shown in the accompanying charts.

CTS also includes comments, but not ratings, for five more packages: AccountMate from SourceMate Information

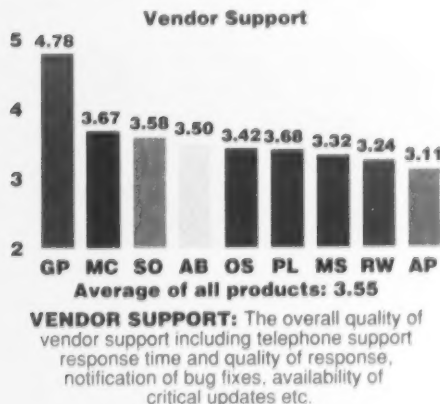
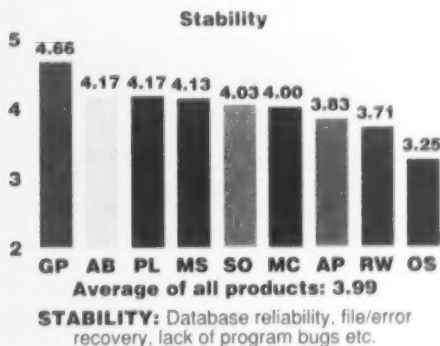
Systems Inc., BusinessWorks from Manzanita Software Systems, CYMA Professional Accounting Series from Cyma Systems Inc., Libra from Libra Corp. and SBT Database Accounting Library from SBT Corp. Many products also come in versions for OS/2 or UNIX, and all support popular LANs.

A quick look at the results of this year's survey shows the widest spread in overall combined scores—a full point—between top ranked Great Plains from Great Plains Software and the lowest, but still respectably ranked, CA-ACCPAC Plus from Computer Associates International Inc. Overall, Great Plains ranked 4.51 out of a possible 5.0; ACCPAC Plus ranked 3.50. If these were high school test scores, they would rank at about a 92, or an A-, for Great Plains and a 70, or a C-, for ACCPAC Plus.

CTS president Sheldon Needle says the point spread is revealing: "The way the numbers run, a point is a lot. A point is the difference between mediocrity and thinking highly of a product." Still, respondents' comments may be the meat of the study; they identify trouble spots in features, technical sturdiness and support. Accounting software consultant Carol Lisook, manager of information systems for Dallas-based accounting firm Travis, Wolff & Co., finds the comments more useful than the ratings: "It's good to see what other consultants have to say about their experience with products."

To stay fully informed, Lisook maintains a library of accounting software documentation, and also buys CTS's guide, which includes regularly updated tables of more than 800 features, as well as pricing and support criteria for 18 leading microcomputer accounting products. That much information is essential to recommending accounting software, Lisook says, because "each client needs something unique. And the program that I think would have any feature you'd want often doesn't have that feature."

A professional services client of Lisook's, for example, had selected a system because it included a job-costing module. Only after experience did the client discover that the package produced reports based on construction job costing, and they couldn't be modi-



SOFTWARE

APPLICATIONS

A Do-It-Yourself Software-Rating System

fied to better fit a services company like his. Lisook showed the client that he needed not job costing, but a modifiable time and billing package integrated with accounts payable. Lisook could find only one product that suited that client's needs: State Of The Art Inc.'s MAS 90 Evolution/2.

Lisook's client is typical of companies that try to choose accounting software without looking into the details. Says Boulay's Snyder, "I've seen a lot of situations where the questions [customers] ask are as broad as 'Do you do billing?' They don't ask more detailed questions about whether what those systems do fits well with their business."

"The process you have to go through," says Coopers & Lybrand's Bernstein, who uses the CTS guide, "is an interview process and then the questionnaire process with it. You take a look at every feature, making sure that the client understands each feature. It's painstaking, but as soon as they get through it, they're very pleased." The CTS questionnaire includes a section on technical issues like platform and LAN support and security; Bernstein takes his clients' is folk through that part.

The painstaking approach can't help but turn up plenty of unique features and distinctions, both technical and financial. On the technical side, for instance, only Libra runs under Digital Equipment Corp.'s VAX/VMS operating system (although value-added re-

To help with the all-important needs analysis phase of accounting software selection, Computer Training Services Inc., offers a detailed questionnaire in a Lotus 1-2-3 worksheet called The Requirements Analyst. Users can use the worksheet to organize "must have" and "nice to have" requirements for more than 800 features; the Requirements Analyst then automatically ranks the 18 accounting products in its database (updated semiannually) on the basis of the requirements met by each.

Ron Bernstein, senior associate

sellers have ported RealWorld Corp.'s package to VMS, RS/6000 and other platforms), and only Great Plains and SBT run on the Macintosh.

Some products feature integrated vertical industry modules. Macola Inc.'s package sports manufacturing modules; Cyma and RealWorld products feature point-of-sale modules. Companies that want maximum flexibility want source code, and you can get it for some, like AccountMate and Open Systems Accounting, but not for others, like Great Plains and Advanced Business Microsystems Inc.'s Platinum. And spreadsheet interfaces are available for some. Recently, Computer As-

sociates added DynaView, a dynamic link between ACCPAC and CA-SuperCalc or Lotus 1-2-3.

There's also extreme variation in network pricing schemes—the product that's a bargain for three users may be a bust for 20. Unlike some packages, which began as stand-alone products and were later ported to networks, Platinum was built from the ground up as a distributed LAN system, and it may have advantages in performance, concurrency or other features in large LAN environments.

Sometimes, seemingly picky criteria can make a big difference in some shops. Bernstein points out that merger mania begets unexpected accounting consolidations, and these often demand extra long fields to accommodate combined names and other information during the transition.

And the competitive accounting software market changes fast. In April, for example, Macola announced that it will soon produce a UNIX version, and Solomon Software has announced a big boost in the network performance of its Solomon III. Studies are a good starting point, but buyers should always check in with vendors, too, to see what's really new. Needle recommends contacting customer references for their comments, as well.

There's a lot you can do to up your chances of finding the right accounting software. There's only one thing you can't do: too much.

Who's Who In Accounting Software

To kick off a detailed investigation of the PC LAN accounting software packages and consultants mentioned in this story, circle the appropriate numbers on the Reader Card.

Company	Circle	Manzanita Software Systems	
Advanced Business Microsystems Inc.		BusinessWorks	409
Platinum	400	Open Systems Inc.	
Boulay, Heutmaker, Zibell & Co.		Open Systems Accounting	410
(Consultant)	401	RealWorld Corp.	
Computer Associates International Inc.		RealWorld Accounting & Business System	411
ACCPAC BPI, ACCPAC Plus	402	SBT Corp.	
Computer Training Services, Inc.		SBT Database Accounting Library	412
(Accounting software survey)	403	Solomon Software	
Coopers & Lybrand		Solomon III	413
(Consultant)	404	SourceMate Information Systems Inc.	
Cyma Systems Inc.		AccountMate	414
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Great Plains Software		MAS 90 Evolution/2	415
Great Plains	406	Travis, Wolff & Co.	
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Macola	408		

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MANAGEMENT

ECONOMIC TRENDS

Japan Sneezed, So Grab Your Hanky

Used to be, when the U.S. economy sneezed, the rest of the world took out its handkerchiefs. This year, it's Japan that has the sniffles and the U.S. information technology industry is grabbing for the Kleenex.

Yes, the DATAMATION Information Systems Performance Indicator (ISPI) finally inched past the magic 100 mark last month, signaling the beginning of a growth period at last for IT. By year-end 1992, we expect the indicator to surpass 106. But no higher.

In previous turnarounds, the ISPI has reached much higher levels, rising as high as 120 in 1985, for example. This time around, foreign sales, which helped shore up the IS industry during last year's recession, are stalling.

Last year, Japan—the single largest country market for information technologies and products—sucked up 14% of U.S. computer equipment exports. But this year, despite several cuts in the discount rate by the Bank of Japan, the Japanese economy is going through its own special kind of downturn.

Consensus GNP forecasts for Japan place growth at only 2.3% for calendar year 1992. That may seem relatively healthy compared to the United States's "glowing" forecast of 2% growth this year, but it's a far cry from Japan's 1991 GNP growth of 4.4%.

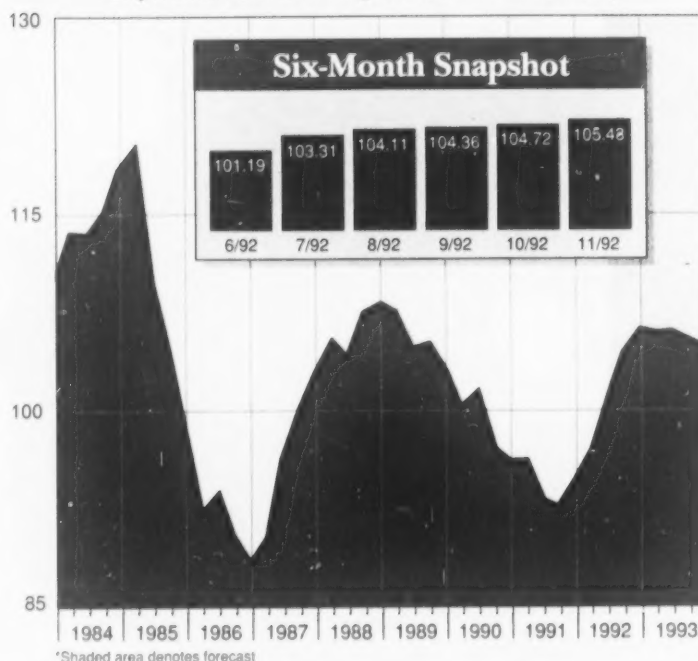
In fact, business investment, which energized Japan's growth in the past, seems to have run out of fuel this year. Based on surveys conducted by several Japanese organizations, firms plan on cutting spending on plant and equipment by as much as 5% this year.

The situation in Japan is only one example of what U.S. exporters face as recession wends its way through other nations' economies. U.S. information systems vendors will need to focus on home markets this year as a result. ■

By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services, call Dan Buchan at (617)-630-2105.

The IS Performance Indicator

Only A Small Fever Is Building For The Information Industry



	Feb. 1992	Jan. 1992	% Change 2/92-1/92	Feb. 1991	% Change 1991/1992
■ Information-Processing Equipment					
Shipments (SA, \$ billions)	10.19	10.46	-2.6	9.36	8.8
New Orders (SA, \$ billions)	9.94	10.18	-2.4	9.79	1.5
Unfilled Orders (SA, \$ billions)	25.26	25.50	-1.0	28.95	-12.8
Inventory (SA, \$ billions)	15.01	15.32	-2.0	16.11	-6.8
■ Computer Production Workers					
Employment (NSA, thousands)	253.0	253.3	-0.1	269.4	-6.1
Average Weekly Hours (monthly avg.)	41.8	41.7	0.2	41.1	1.7
■ Stock Index					
S&P's Computer Systems Stock Price Index	155.5	160.6	-3.2	201.8	-22.9
■ Contracts & Orders					
New Plant & Equipment (SA, \$ billions)	34.4	31.7	8.5	37.7	-8.9

SA= seasonally adjusted;
NSA= not seasonally adjusted

Source: U.S. Commerce Dept., Standard & Poor's forecasts, Cahners Economics

Source: DATAMATION, Cahners Economics

World IT Sales Rise 4.1% To \$290 Billion *page 12*

A CAHNNERS PUBLICATION

DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

JUNE 15, 1992

THE DATAMATION 100

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DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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North American sales limp 2.9% to \$190 billion as the computer industry matures.

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CONTENTS



Artist Bill Foss works wonders with graphics.

About The Cover

When we have our annual meeting to discuss cover concepts for the DATAMATION 100 issue, we don't always agree on the exact form it should take, but we do always agree on the function—a clear and resounding image.

This year, we've borrowed from the technology we quantify in these pages to create a cover image that, we believe, has no equal. With the help of Silicon Graphics Inc. (No. 74 on the DATAMATION 100) and artist Bill Foss, we have brought to life our concept using some of the same Silicon Graphics technology that created the alien in the smash hit movie *Terminator 2: Judgment Day*.

Working on an Iris Indigo workstation, Foss first created a spherical model using Wavefront Technology Inc.'s Advanced Visualizer software—a 3-D modeling, animation and rendering package. To make it appear three dimensional, he then wrapped around the sphere a texture map image of the Earth.

That image was made by compiling hundreds of satellite images on Silicon Graphics workstations to create one Earth image. It was provided by courtesy of Tom Van Sant and The Geosphere Project*. Originally, the Earth was turned to feature Europe, but when we suggested showing North America instead, Foss was able to make the change in minutes.

The number 100 was then digitized, extruded to appear three dimensional and then curved around the globe. Reflections of the land and sea from the Earth were then colored to show depth.

Finally, our special effect "whoosh" was added across the 100 and around the orbit of the Earth, using Wavefront's Video Composer, a special effects and image compositing product that layers multiple images seamlessly to give the impression of movement.

Surprisingly, the project took Foss less than six hours. Modeling took about two hours; putting the whole scene together about three hours; and final special effects took 23 minutes. Foss credits his swiftness to the relative ease of use and speed of the software, noting that it is in the forefront of technology for both video and film. The final product is a high-resolution image (4,096 dots per inch) requiring a 13-megabyte uncompressed file.

Not quite *Sports Illustrated's* hologram of Michael Jordan, but there's always next year.

* Satellite map image provided by courtesy of Tom Van Sant and The Geosphere Project, with assistance from NOAA, NASA, and Eyes on Earth. Technical direction by Lloyd Van Warren. Source data derived from NOAA-TIROS-N series satellites. Completed April 15, 1990. All rights reserved by Tom Van Sant Inc., 146 Entrada Dr., Santa Monica, CA. 90402, (800)-845-1522. © Tom Van Sant/The Geosphere Project.

About The Numbers

All figures used in the DATAMATION 100 are for calendar year 1991. For those companies operating on a fiscal year that doesn't coincide with the calendar year, DATAMATION either compiles quarterly information or relies on the estimates provided by the companies themselves or by industry analysts. DATAMATION also allows companies to restate the previous year's figures. We do not include revenue from basic data transmission services, stand-alone typewriters or cash registers, instrumentation, semiconductor, printed circuit boards, automatic test equipment, supplies (with the exception of magnetic media), industrial con-

trol devices, central office telephone switches, analog private branch exchanges (PBXs) or computer-output micrographic systems.

Currencies for foreign companies are computed based on the 1991 floating year figure provided by the Organization for Economic Cooperation and Development (OECD). The following currencies are equivalent to one U.S. dollar: Canadian dollar, 1.146; Danish krone, 6.398; French franc, 5.641; German deutsche mark, 1.659; Italian lire, 1,241; Japanese yen, 134.5; Korean won, 733.229; Dutch gulden, 1.87; Taiwanese dollar, 26.553; British pound, 0.567.

FOR MORE INFORMATION

Want even more information on the worldwide and North American DATAMATION 100 companies, or their products and services? Circle the appropriate numbers as listed below on the Reader Card on page 48.

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A Maturing Industry



When we first began the data collection effort for this year's DATAMATION 100, we suspected that 1991 might end up being the first year in our measurement history that the industry would not grow in dollar volume. In fact, because of the more than \$4 billion loss in IS revenue at IBM last year and the effects of recession at many other companies, we even thought the industry would retract, falling into the negative column for the first time in this, the 11th year of the DATAMATION 100.

Well, the results are in, and it was a close shave. The DATAMATION 100 didn't go negative in 1991 but did post only the barest of increases. The worldwide computer industry, as measured by the DATAMATION 100, grew a scant 4.1% to \$290 billion. And the North American segment inched upward even less, rising 2.9% to \$190 billion.

Recession aside, what we think comes out loud and clear from this year's 100 effort is that a significant maturation of the industry is under way. And we might even suggest that a realignment of corporate power is under way, too. For the first time in the eight years we've been tracking the worldwide IT industry, the top spots in our ranking have changed significantly. Digital Equipment Corp., which has held the No. 2 spot worldwide since 1984 behind industry leader IBM, fell into fourth place (it did, however, hold onto its No. 2 spot in the North American market). The Maynard, Mass., company was succeeded by two Japanese companies, Fujitsu Ltd. and NEC Corp.

This year's DATAMATION 100 follows the three-part format we established last year. In this issue, we present our ranking of the top 100 suppliers of information technology products and services worldwide, as well as the top 100 IT suppliers incorporated in North America and profiles of the North American companies. In addition, we feature an exclusive interview with IBM president Jack Kuehler.

On July 1, our ranking of the top 25 Europe-based suppliers will appear, with profiles of all companies making that grade. And then on September 1 we conclude with the top 25 Asia-based companies.

All in all, it's a rapidly changing industry, with many new faces and players and different rules of competition. Understanding where things are going is critical for you, the consumers of information technology. We hope the DATAMATION 100 helps light the way.

David R. Brousell

—David R. Brousell, Editor-In-Chief



**Winner Jesse H. Neal Editorial
Achievement Award
1986, 1987**

Coming Next Issue:

- The European 25
- SynOptics's new intelligent hub
- Why Non-ISers are managing application development

World IT Sales Stagger 4.1% To \$290 Billion

*North American sales limp 2.9% to 190 billion
as the computer industry matures.*

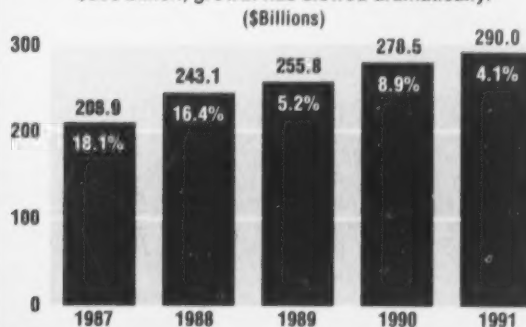
Last year, American moviegoers were dazzled by the computer-based special effects in *Terminator 2*, especially the "morphing" sequence in which the alien metamorphoses from a tile floor into a police officer. The computer industry went through its own dramatic morphing experience, with profound effects on employees, stockholders and customers. It changed from a perky, rap-dancing teenager to a middle-aged couch potato.

If you think that the industry's snooze through 1991 was just a nap induced by the recession, you're ignoring the signs of industrial aging. The computer industry has matured. Revenue growth of the worldwide DATAMATION 100 has been declining since the 21% jump in 1986. The meager 4.1% advance to \$290.0 billion for the companies that lumbered into the DATAMATION 100 in 1991 reflects more than just a barely recovering economy in the United States, shaky prospects in Europe and the beginning of a recession in Japan.

Continued on page 14

Industry Growth Slows

As worldwide DATAMATION 100 revenues near \$300 billion, growth has slowed dramatically.



The DATAMATION 100

The top 100 companies worldwide.

WORLD RANK					WORLD RANK						
'91	'90	COMPANY	IS REVENUE '91	% '90 CHANGE	'91	'90	COMPANY	IS REVENUE '91	% '90 CHANGE		
1	1	IBM	62,840.0	67,090.0	-6.3%	51	53	Commodore	1,038.5	995.7	4.3%
2	3	Fujitsu	19,330.9	12,361.5	56.4%	52	58	Finsiel	1,015.6	816.7*	24.3%
3	4	NEC	15,317.6	12,350.3	24.0%	53	59	American Express	995.0	827.0	20.3%
4	2	Digital	14,237.8	13,072.3	8.9%	54	55	Motorola	987.0	954.0	3.5%
5	7	Hewlett-Packard	10,726.0	9,514.5*	12.7%	55	62	Maxtor	961.0	789.4	21.7%
6	5	Hitachi	10,310.2	9,590.9	7.5%	56	57	3M	935.0	875.0	6.9%
7	18	AT&T	8,169.0	2,900.0	181.7%	57	78	Dell	889.9	546.0	63.0%
8	6	Unisys	8,000.0	9,302.0	-14.0%	58	60	Cray	862.5	804.4	7.2%
9	8	Siemens Nixdorf	7,308.6	7,654.7*	-4.5%	59	61	General Electric	850.0	800.0	6.3%
10	11	Apple	6,496.0	5,740.0	13.2%	60	71	Lotus	828.9	692.2*	19.7%
11	9	Olivetti	6,050.8	6,414.5	-5.7%	61	74	AST Research	827.3	586.5	41.1%
12	10	Groupe Bull	5,929.8	6,349.6	-6.6%	62	63	British Telecom	823.6	776.8	6.0%
13	13	Toshiba	5,115.9	4,764.5	7.4%	63	64	Acer	811.0	751.0	8.0%
14	15	Matsushita	5,068.8	4,240.4*	19.5%	64	70	Comparex	752.3	689.4	9.1%
15	14	Canon	3,751.5	4,040.1*	-7.1%	65	66	Texas Instruments	747.9	700.0	6.8%
16	19	EDS	3,666.1	2,870.0	27.7%	66	—	Price Waterhouse	733.0	583.0*	25.7%
17	22	Sun	3,454.7	2,762.8	25.0%	67	83	Novell	710.4	526.3*	35.0%
18	20	ICL	3,308.1	2,862.9	15.6%	68	—	Nomura	706.3	652.3*	8.3%
19	16	Compaq	3,271.4	3,598.0	-9.1%	69	67	Racal	679.0	625.2*	8.6%
20	21	Xerox	2,930.0	2,800.0	4.6%	70	—	Packard Bell	675.9	518.0	30.5%
21	23	Seagate	2,668.7	2,667.6	0.0%	71	68	Tatung	667.3	593.4*	12.5%
22	27	NTT	2,492.3	2,114.0	17.9%	72	75	Science Applications	653.0	569.0	14.8%
23	25	Nihon Unisys	2,413.4	2,279.0	5.9%	73	80	Sema Group	640.5	533.4	20.1%
24	42	Microsoft	2,275.9	1,480.0	53.8%	74	86	Silicon Graphics	638.0	482.1	32.3%
25	35	Andersen Consulting	2,260.0	1,880.0*	20.2%	75	—	Gateway 2000	635.0	275.0	130.9%
26	28	Mitsubishi	2,203.7	2,055.5	7.2%	76	—	PRC	622.8	632.4*	-1.5%
27	29	Oki	2,078.5	1,989.0	4.5%	77	73	SHL	601.2	599.0	0.4%
28	34	Ricoh	1,970.3	1,774.3	11.0%	78	72	NYNEX	601.0	618.0	-2.8%
29	33	TRW	1,945.0	1,852.0	5.0%	79	—	Coopers & Lybrand	571.0	538.8*	6.0%
30	38	CSC	1,944.7	1,679.3	15.8%	80	81	Sligos	569.3	530.7	7.3%
31	24	Wang	1,940.0	2,363.0	-17.9%	81	77	Martin Marietta	561.1	549.4	2.1%
32	32	Tandem	1,932.9	1,873.1	3.2%	82	85	Ernst & Young	551.0	490.0	12.4%
33	36	ADP	1,810.0	1,736.0*	4.3%	83	—	Bell Atlantic	550.0	480.0*	14.6%
34	37	Cap Gemini	1,776.3	1,684.9	5.4%	84	79	D & B Software	548.7	539.0	1.8%
35	39	C. Itoh	1,710.0	1,595.1	7.2%	85	76	CSK	542.3	527.2*	2.9%
36	26	Amdahl	1,702.0	2,158.8	-21.2%	86	91	Mitac	540.0	450.0*	20.0%
37	43	Conner Peripherals	1,599.0	1,337.5	19.6%	87	90	WordPerfect	532.5	452.4	17.7%
38	49	StorageTek	1,584.9	1,545.2*	2.6%	88	84	Lockheed	525.0	420.0*	25.0%
39	40	Seiko Epson	1,539.0	1,590.7	-3.2%	89	—	Sony	520.4	499.5*	4.2%
40	30	Memorex Telex	1,533.1	1,634.9*	-6.2%	90	—	CompuAdd	513.6	N/A	N/A
41	47	Northern Telecom	1,460.0	1,220.0	19.7%	91	—	Borland	501.6	418.4*	19.9%
42	44	Computer Associates	1,437.8	1,310.7	9.7%	92	95	Everex	492.5	427.6	15.2%
43	41	Prime	1,382.4	1,589.0	-13.0%	93	88	Wyse	478.4	460.0	40.0%
44	46	Data General	1,212.0	1,237.4	-2.1%	94	87	Western Digital	478.2	460.2	3.9%
45	52	Intergraph	1,195.4	1,044.6	14.4%	95	89	SD-Scicon	472.7	455.6	3.7%
46	50	Control Data	1,172.6	1,121.9	4.5%	96	96	Tandon	461.4	439.9*	4.9%
47	54	Intel	1,100.0	980.0	12.2%	97	97	Stratus	448.6	403.9	11.1%
48	51	Oracle	1,085.0	1,002.0*	8.3%	98	—	Getronics	442.5	362.7	22.0%
49	65	Quantum	1,073.6	716.3	49.9%	99	—	Intec	440.9	402.7	9.5%
50	48	Tandy	1,070.6	1,208.0*	-11.4%	100	99	Shared Medical	438.7	403.1	8.8%

* Restated figure Revenue figures are in \$ millions.

THE DATAMATION 100

OVERVIEW

Signals of middle age abound, reflecting a maturation process similar to the one undergone by the automobile industry, the appliance industry and other fixtures of western civilization. "You won't see the 20% growth rates of the past again," says Richard O'Brian, corporate economist at Hewlett-Packard Co. and one of the industry's leading prognosticators. "You will see double-digit growth during a boom, maybe 10 to 15% per year, but not 20 to 30%." Other industry economists agree with O'Brian's outlook, but government economists are more pessimistic. The Commerce Department forecasts that the real output (i.e., subtracting out the effects of inflation and deflation) of U.S. computer equipment makers will grow at an annual rate of only 7.6% through the year 2005, "much lower than the 31.8% rate posted over the 1975 to 1990 period."

A key reason for the worldwide computer industry's slowing growth rate and maturation is its relative size. While most industry officials haven't noticed, the computer industry has grown to a hefty mass that more closely resembles other mature sectors of the economy. Last year, the \$184.7 billion in IS revenue amassed by the North American DATAMATION 100 exceeded the \$175.4 billion in sales of petroleum products, as recorded by the Commerce Department. That means that Digital Equipment Corp., HP, IBM and the other 97 firms collectively outweigh the oil businesses of Chevron Corp., Exxon Corp., Mobil Corp. and the rest of the oil-refining and -processing sector.

In fact, the Commerce Department's tallies of industry revenues show that the combined computer and electronics segments of the U.S. econo-



The Commerce Department predicts that the computer industry will be outpaced by the automobile industry this year.

Falling Fortunes

The North American companies that couldn't keep up in 1991.

COMPANY	1991 IS REV.	1990 IS REV.	DECREASE
1 Amdahl	1,702.0	2,158.8	-21.2%
2 Concurrent	238.0	296.0	-19.6%
3 Wang	1,940.0	2,363.0	-17.9%
4 Genicom	200.5	238.2	-15.8%
5 3Com	370.0	437.0	-15.3%
6 Sequent	213.3	248.8	-14.3%
7 Unisys	8,000.0	9,302.0	-14.0%
8 MAI Systems	328.6	382.0	-14.0%
9 Prime	1,382.4	1,589.0	-13.0%
10 Tandy	1,070.6	1,208.0	-11.4%

All revenue figures in \$ millions.

my are 40% larger than the automobile industry—\$287 billion for the electronics/computer segment versus \$205 billion for the motor vehicles and parts businesses. In addition, Cahners Economics predicts that next year the computer and electronics sectors will constitute the largest single industry in the United States, narrowly exceeding the chemical industry as holder of the title—\$322 billion versus \$318 billion, respectively. So the pundits are correct—we are indeed in the information age.

Other signs of industrial maturity were clearly evident last year, when the strength of the recession stunned the industry. Market saturation, an overabundance of suppliers pummeling prices and imports equaling exports are three symptoms of middle age that became apparent last year. And their effects won't go away as the recovery gains steam.

Industry visionaries such as Bill Gates and Steve Jobs have dreamed of computer technology proliferating to the point of ubiquity, and the industry has come closer to success than most people realize. The Electronic Industries Association estimates that more than one-third of the nation's homes have a personal computer. Approximately 90% of the worldwide industry's overall consumer and corporate sales represent replacement business, according to HP's O'Brian, which means that the years of fertile growth due to an abundance of virgin territories are over. "It's becoming like the car market—in most cases, we're selling to a customer who already has one," O'Brian says. Although most households remain PC-less, growth of the home PC market is not going to spur dramatic computer industry growth over the next decade because the far larger business markets are almost entirely saturated.

Fast Trackers

The North American companies that grew the most in 1991.

COMPANY	1991 IS REV.	1990 IS REV.	INCREASE
1 AT&T*	8,169.0	2,900.0	181.7%
2 Gateway 2000	635.0	275.0	130.9%
3 Zeos	230.9	127.1	81.7%
4 Cabletron	257.4	150.1	71.5%
5 Dell	889.9	546.0	63.0%
6 ASK Computer*	394.6	249.7	58.0%
7 Microsoft	2,275.9	1,480.0	53.8%
8 FiServ	281.3	183.0	53.7%
9 Quantum	1,073.6	716.3	49.9%
10 Systematics	377.0	255.0	47.8%

* Increase due to acquisition.
All revenue figures in \$ millions.

1991 IN PERSPECTIVE

THE DATAMATION 100

OVERVIEW

Another significant sign of industrial aging is that the hardware portions of the U.S. computer industry last year ceased to be on the plus side of the U.S. trade ledger. The amount of computer equipment imported into the country equaled the amount exported for the first time, at about \$26 billion. The leading exporters among the North American DATAMATION 100 sold \$66.1 billion worth of goods and services abroad in 1991, down just slightly from the \$66.3 billion shipped the prior year. U.S. consumer and corporate demand for low-cost PCs, for parts from Asian vendors and for laser printers from Japan have overtaken U.S. strengths in microprocessors, software and services.

Thus it should come as no surprise that there's a somber short-term prognosis for the computer industry in comparison with other industries. The Commerce Department predicts that the U.S. computer industry will be out paced by the mundane this year: makers of automobiles, trucks, refrigerators, vacuum cleaners and a host of other pedestrian goods will post better growth in 1992. Commerce predicts that the U.S. computer industry will achieve a 4.3% increase in revenue this year, while Ford Motor Co., General Electric Co., Hoover Co., Whirlpool Corp. and the remaining survivors of the industry shake-outs of the 1970s are expected to score a 5 to 7.4% gain.

Computer-industry economists are more upbeat about the prospects for 1992 than the Commerce Department, but all sides acknowledge that the industry's growth will lag behind that of the older sectors of the economy. O'Brian's computer-industry forecast is for 5 to 6% growth this year worldwide. Another leading industry forecaster, Vladi Catto, chief economist for Texas Instruments Inc. in Dallas, predicts 7% growth in 1992. Just about everyone expects the computer industry to rebound faster than the 3% increase in gross domestic product expected for the overall U.S. economy.

If the computer industry's revenue growth last year was a disappointment, the profit picture was a disaster, particularly among older, broad-based systems suppliers. Severance costs, other restructuring charges and operating losses by Digital, Eastman Kodak Co., IBM, Texas Instruments Inc., Unisys Corp. and others vitiated the industry's prior record of strong net earnings growth. In fact, net earnings for the North American DATAMATION 100 plummeted 72.3% from \$27.1 billion in 1990 to a mere \$7.5 billion in 1991. IBM had been the most profitable company



Twelve new companies entered this year's worldwide DATAMATION 100.

in the United States for many years—its 1990 net earnings were in excess of \$6 billion. IBM's decline last year from a growth company to a money loser reflects its own miscalculations as well as the industry's aging.

The red ink at Big Blue, Unisys and 25 other of the North American DATAMATION 100 companies last year compressed the sector's profits to near invisibility relative to other industries: the profitability of *Fortune* magazine's ranking of the 25 largest computer companies put that sector at No. 8 on the profit parade, as their collective profits rose only 1.1% last year. In contrast, *Fortune* shows the tobacco sector reaping 27% gains in net income and the drug companies swelling net earnings 16%.

Still, layoffs at Compaq Computer Corp., Data General Corp., Prime Computer Inc., TRW Inc. and other firms will eventually reduce the flow of red ink coming from their future income state-

Top Performers

The North American companies with the highest return on sales.

COMPANY	1991 % RETURN ON SALES	1990% RETURN ON SALES
1 Novell	25.9	20.8
2 Microsoft	25.5	24.0
3 Adobe	22.5	23.7
4 Autodesk	20.3	23.9
5 Cabletron	20.0	19.8
6 Legent	17.4	19.2
7 Intel	17.1	16.6
8 ADP	13.2	12.7
9 Cray	13.1	14.0
10 Computer Associates	12.0	12.4

ments and will boost productivity. Even though U.S. hardware sales are expected to increase, the Commerce Department predicts that employment in the segment will shrink another 4.3% this year, after a 6% decline in 1991. Indeed, Commerce is predicting an annual 1% decline in employment of computer hardware makers through the year 2005.

Also, the industry's greater emphasis on software and services will improve its lagging performance. Such vendors as Andersen Consulting and Electronic Data Systems Corp., which sell custom programming, systems integration, facilities management and other computer services, are the frisky offspring of the mature computer industry. They face little price competition and growing opportunities. The plague of local area network incompatibilities faced by MIS depart-

Continued on page 20

The DATAMATION North American 100

RANK		COMPANY	1991	1990	IS REV.	1991	IS AS %	NET EARNINGS	
1991	1990		IS REV.	IS REV.	% CHANGE	TOTAL REV.	OF TOTAL REV.	1991	1990
1	1	IBM	62,840.0	67,090.0	-6.3%	64,792.0	97.0%	-2,827.0	6,020.0
2	2	Digital	14,237.8	13,072.3	8.9%	14,237.8	100.0%	-864.4	-94.5
3	4	Hewlett-Packard	10,726.0	9,514.5*	12.7%	14,949.0	71.8%	856.0	771.0*
4	8	AT&T	8,169.0	2,900.0	181.7%	63,089.0	12.9%	522.0	2,735.0
5	3	Unisys	8,000.0	9,302.0	-14.0%	8,696.0	92.0%	-1,393.0	-437.0
6	5	Apple	6,496.0	5,740.0	13.2%	6,539.1	99.3%	325.4	500.6
7	9	EDS	3,666.1	2,870.0	27.7%	7,099.0	51.6%	547.5	496.9
8	11	Sun	3,454.7	2,762.8	25.0%	3,454.7	100.0%	199.3	151.0
9	7	Compaq	3,271.4	3,598.0	-9.1%	3,271.4	100.0%	130.9	454.9
10	10	Xerox	2,930.0	2,800.0	4.6%	17,830.0	16.4%	454.0	243.0
11	12	Seagate	2,668.7	2,667.6	0.0%	2,668.7	100.0%	-11.1	99.7
12	21	Microsoft	2,275.9	1,480.0	53.8%	2,275.9	100.0%	581.4	355.6
13	17	Andersen Consulting	2,260.0	1,880.0*	20.2%	2,260.0	100.0%	N/A	N/A
14	16	TRW	1,945.0	1,852.0	5.0%	7,913.0	24.6%	-140.0	208.0
15	19	CSC	1,944.7	1,679.3	15.8%	1,944.7	100.0%	65.5	68.0
16	13	Wang	1,940.0	2,363.0	-17.9%	1,940.0	100.0%	-380.0	-665.4
17	15	Tandem	1,932.9	1,873.1	3.2%	1,932.9	100.0%	-66.5	98.1
18	18	ADP	1,810.0	1,736.0*	4.3%	1,810.0	100.0%	238.9	219.7*
19	14	Amdahl	1,702.0	2,158.8	-21.2%	1,702.0	100.0%	11.0	184.0
20	22	Conner Peripherals	1,599.0	1,337.5	19.6%	1,599.0	100.0%	92.5	130.0*
21	27	StorageTek	1,584.9	1,545.2*	2.6%	1,584.9	100.0%	93.1	92.4*
22	25	Northern Telecom	1,460.0	1,220.0	19.7%	8,182.5	17.8%	496.5	460.2
23	23	Computer Associates	1,437.8	1,310.7	9.7%	1,437.8	100.0%	173.0	162.0
24	20	Prime	1,382.4	1,589.0	-13.0%	1,382.4	100.0%	-16.9	56.4*
25	24	Data General	1,212.0	1,237.4	-2.1%	1,212.0	100.0%	77.2	-106.9*
26	30	Intergraph	1,195.4	1,044.6	14.4%	1,195.4	100.0%	71.1	62.6
27	28	Control Data	1,172.6	1,121.9	4.5%	1,524.9	76.9%	-9.8	2.7
28	32	Intel	1,100.0	980.0	12.2%	4,778.6	23.0%	818.6	650.0
29	29	Oracle	1,085.0	1,002.0*	8.3%	1,085.0	100.0%	76.0	20.0*
30	39	Quantum	1,073.6	716.3	49.9%	1,073.6	100.0%	49.6	66.7
31	26	Tandy	1,070.6	1,208.0*	-11.4%	4,514.8	23.7%	176.5	260.5*
32	31	Commodore	1,038.5	995.7	4.3%	1,038.5	100.0%	50.1	40.2
33	35	American Express	995.0	827.0	20.3%	25,763.0	3.9%	789.0	181.0
34	33	Motorola	987.0	954.0	3.5%	11,341.0	8.7%	454.0	499.0
35	38	Maxtor	961.0	789.4	21.7%	961.0	100.0%	-65.7	10.8
36	34	3M	935.0	875.0	6.9%	13,340.0	7.0%	1,154.0	1,308.0
37	48	Dell	889.9	546.0	63.0%	889.9	100.0%	50.9	27.2
38	36	Cray	862.5	804.4	7.2%	862.5	100.0%	113.0	113.0
39	37	General Electric	850.0	800.0	6.3%	60,236.0	1.4%	2,636.0	4,300.0
40	42	Lotus	828.9	692.2*	19.7%	828.9	100.0%	43.1	23.3
41	45	AST Research	827.3	586.5	41.1%	827.3	100.0%	70.2	52.5
42	40	Texas Instruments	747.9	700.0	6.8%	6,784.0	11.0%	-409.0	-39.0
43	67	Price Waterhouse	733.0	583.0*	25.7%	3,603.0	20.3%	N/A	N/A
44	50	Novell	710.4	526.3*	35.0%	710.4	100.0%	184.3	109.7*
45	—	Packard Bell	675.9	518.0	30.5%	819.5	82.5%	4.6	8.5
46	46	Science Applications	653.0	569.0	14.8%	1,280.0	51.0%	35.0	33.3
47	53	Silicon Graphics	638.0	482.1	32.3%	638.0	100.0%	36.6	39.8
48	—	Gateway 2000	635.0	275.0	130.9%	635.0	100.0%	N/A	N/A
49	—	PRC	622.8	632.4	-1.5%	685.2	90.9%	N/A	N/A
50	44	SHL	601.2	599.0	0.4%	601.2	100.0%	-17.5	-35.0

* Restated figure

N/A = Not available

All revenue figures are in \$ millions.

The DATAMATION North American 100

RANK		COMPANY	1991	1990	IS REV.	1991	IS AS %	NET EARNINGS	
1991	1990		IS REV.	IS REV.	% CHANGE	TOTAL REV.	OF TOTAL REV.	1991	1990
51	43	NYNEX	601.0	618.0	-2.8%	13,228.8	4.5%	600.8	949.4
52	90	Coopers & Lybrand	571.0	538.8*	6.0%	1,472.0	38.8%	N/A	N/A
53	47	Martin Marietta	561.1	549.4	2.1%	6,075.4	9.2%	313.1	327.6
54	52	Ernst & Young	551.0	490.0	12.4%	5,400.0	10.2%	N/A	N/A
55	68	Bell Atlantic	550.0	480.0*	14.6%	12,279.7	4.5%	-222.7	1,312.5
56	49	D & B Software	548.7	539.0	1.8%	548.7	100.0%	N/A	N/A
57	56	WordPerfect	532.5	452.4	17.7%	532.5	100.0%	N/A	N/A
58	51	Lockheed	525.0	420.0*	25.0%	9,800.0	5.4%	308.0	335.0
59	—	CompuAdd	513.6	N/A	N/A	513.6	100.0%	N/A	N/A
60	—	Borland	501.6	418.4*	19.9%	501.6	100.0%	-80.7	5.6
61	59	Everex	492.5	427.6	15.2%	492.5	100.0%	-31.4	-0.8
62	55	Wyse	478.4	460.0	4.0%	478.4	100.0%	N/A	N/A
63	54	Western Digital	478.2	460.2	3.9%	915.8	52.2%	-95.5	-78.6
64	60	Tandon	461.4	439.9*	4.9%	461.4	100.0%	-48.0	25.6
65	61	Stratus	448.6	403.9	11.1%	448.6	100.0%	49.7	37.0
66	62	Shared Medical	438.7	403.1	8.8%	438.7	100.0%	25.3	22.7
67	58	Mentor	400.1	435.2	-8.1%	400.1	100.0%	-61.6	23.6
68	81	ASK Computer	394.6	249.7	58.0%	394.6	100.0%	-57.6	4.7
69	72	Kodak	390.0	350.0*	11.4%	19,419.0	2.0%	-688.0	703.0
70	79	Systematics	377.0	255.0	47.8%	377.0	100.0%	N/A	N/A
71	57	3Com	370.0	437.0	-15.3%	370.0	100.0%	-33.0	24.0
72	69	Diebold	355.0	328.4	8.1%	506.2	70.1%	35.7	27.1
73	91	Cadence	353.0	322.0*	9.6%	392.0	90.1%	-22.0	6.0
74	66	Micropolis	350.9	381.0	-7.9%	350.9	100.0%	4.3	8.0
75	76	Policy Management	342.0	272.0	25.7%	415.4	82.3%	47.6	37.2
76	64	MAI Systems	328.6	382.0*	-14.0%	328.6	100.0%	-59.8	-84.8*
77	71	Boeing	325.4	320.0	1.7%	29,314.0	1.1%	1,567.0	1,358.0*
78	—	Teradata	297.0	237.8	24.9%	297.0	100.0%	9.1	N/A
79	85	SAS Institute	295.1	240.2	22.9%	295.1	100.0%	N/A	N/A
80	78	American Management	285.2	261.9	8.9%	285.2	100.0%	11.6	10.4
81	84	Computer Task Group	285.1	243.9	16.9%	285.1	100.0%	0.9	7.2
82	86	Autodesk	284.9	237.9	19.8%	284.9	100.0%	57.8	56.8
83	74	Tektronix	283.0	291.4	-2.9%	1,311.0	21.6%	44.9	-70.1
84	—	FiServe	281.3	183.0	53.7%	281.3	100.0%	18.0	14.0
85	77	Datapoint	263.9	265.6	-0.6%	263.9	100.0%	0.3	-66.7
86	75	Gerber Scientific	261.0	279.8	-6.7%	261.0	100.0%	7.4	32.4
87	—	Cabletron	257.4	150.1	71.5%	262.6	98.0%	52.4	31.0
88	—	SynOptics	248.3	176.0	41.1%	248.3	100.0%	26.8	28.2
89	73	Concurrent	238.0	296.0	-19.6%	238.0	100.0%	14.4	-60.0
90	80	Reynolds & Reynolds	232.8	254.2*	-8.4%	591.7	39.3%	25.6	22.7*
91	—	Zeos	230.9	127.1	81.7%	230.9	100.0%	10.3	4.2
92	—	Adobe	229.7	168.7	36.1%	229.7	100.0%	51.6	40.1
93	94	Sterling	228.9	207.0	10.6%	228.9	100.0%	13.1	12.4
94	97	Pyramid	221.6	200.5	10.6%	221.6	100.0%	-11.1	18.4
95	83	National Data	220.6	244.6	-9.8%	220.6	100.0%	-14.6	5.5
96	82	Sequent	213.3	248.8	-14.3%	213.3	100.0%	-48.7	18.8
97	—	Legent	207.8	180.5	15.1%	207.8	100.0%	36.2	34.7
98	95	Bolt Beranek & Newman	206.6	204.3	1.1%	262.9	78.6%	6.6	-34.8
99	100	Information Builders	202.3	191.0*	5.9%	202.3	100.0%	N/A	N/A
100	—	Genicom	200.5	238.2	-15.8%	217.0	92.4%	-13.0	6.6

* Restated figure

N/A = Not available

All revenue figures are in \$ millions.

THE DATAMATION 100

OVERVIEW

ments initiating downsizing programs is leading to large, new networking contracts with these companies. Corporate edicts to reduce costs by reengineering existing processes were manna from heaven for Digital, IBM and other product vendors in the services business. Overall, last year the services sector of the worldwide DATAMATION 100 achieved 13.3% revenue growth.

In fact, the Commerce Department predicts 20% annual growth for the services revenue of U.S. computer companies over the next five years. The Commerce Department cites figures from Input Inc. of Mountain View, Calif., predicting that the global market for information services will grow 16% annually through the year 1995 to total \$420 billion.

Input's and Commerce's definition of computer services includes the burgeoning on-line database access business and audiotex services like 900 numbers, as well as systems integration, custom-programming and more traditional data-process-

team are business whizzes as well as a programming wizards. However, IBM retains its lead in the software sector's revenue parade, thanks to ever higher prices for the software required to run its mainframes, midrange systems and workstations. Big Blue registered \$10.5 billion in software revenue in 1991, a 5.7% increase.

Mainframe software prices may be rising, but mainframe hardware revenue barely inched ahead at 3.0% last year for IBM and the other vendors plowing that exhausted field. Reduced hardware, software and maintenance costs for alternative computer platforms continued to diminish the importance of the Big Iron. Over the past five years, the proportion of worldwide industry revenues stemming from mainframes has declined from 12.6 to 9.5%, and recent DATAMATION IS spending surveys show further deterioration in the U.S. mainframe market this year, as ever more powerful PCs continue to supplant larger machines as the platform of choice for new applications development.

Last year was another dismal failure for many makers of minicomputers and other midrange machines. Overall worldwide revenue was \$22.1 billion in 1991, up only 2.3% from the prior year. Digital was clearly in the worst shape—its VAX minicomputer line is declining faster than the company can introduce its next generation of products, to be based on its hot new Alpha reduced instruction set computing (RISC) microprocessor. Other mini makers are also hurting. Wang Laboratories Inc. essentially abandoned the high costs of staying in the hardware business (its minicomputer revenue dropped 18%) by agreeing to resell IBM's midrange systems. Poor Prime Computer lost \$16.9 million in earnings while registering a 13% drop in revenue to \$1.38 billion. It is phasing out of the proprietary hardware game as it continues its "morph" from a minicomputer maker into basically a computer-aided design and manufacturing (CAD/CAM) software company.

Several minicomputer vendors appeared to be on the road back to financial viability in 1991. Last year, Data General Corp. should have won some "Comeback Of The Year" honors for its improved performance based on its AViiON line of UNIX servers—profits were up a dramatic 77.2%. However, in early 1992 its financial performance weakened.

HP's and IBM's minicomputer businesses were in relatively healthy shape, thanks to new products and sharp marketing. HP's shift to a RISC-based architecture several years ago gave



Thirteen new
companies entered
North American
DATAMATION 100.

In The Red

The 10 North American companies that lost the most money.

COMPANY		1991 EARNINGS LOSS (\$ MIL.)
1	IBM	-2,827.0
2	Unisys	-1,393.0
3	Digital	-864.4
4	Kodak	-688.0
5	Texas Instruments	-409.0
6	Wang	-380.0
7	Bell Atlantic	-222.7
8	TRW	-140.0
9	Western Digital	-95.5
10	Borland	-80.7

ing services. The services of most interest to IS managers—systems integration, custom programming, consulting and training—will generate \$56 billion in revenue this year, according to the Commerce Department, a 14% increase from 1991's level.

Software is another feisty offspring. Software-based revenue for the worldwide DATAMATION 100 jumped 17.2% last year. And the software sector's share of the DATAMATION 100's revenue pie increased 1.3 percentage points to \$33 billion in 1991.

Microsoft Corp. was the software industry revenue growth champion, achieving a 53.8% gain to \$2.28 billion without the aid of acquisitions or hardware sales. Its stupendous growth, due to the Windows operating system and related applications software, again proves that Gates and his

1991 IN PERSPECTIVE

THE DATAMATION 100

OVERVIEW

it bragging rights to one of the best price/performance ratios in the industry. Accordingly, its midrange revenue was up 13.7% last year to \$832 million, according to DATAMATION estimates. IBM's minicomputer business continues strong, based on the acceptance of the AS/400. Its minicomputer revenue was up, albeit only 1.2%, to \$5.9 billion.

Peripherals became another casualty of the industry's maturity in 1991. Unit sales of laser printers are booming, but declining prices are compressing revenues. Last year, worldwide sales of peripherals dropped 2.4% to \$60.7 billion. IBM's peripherals revenue slumped 17.1% for several reasons, including the divestiture of its printer division and the growing competitiveness of the makers of plug-compatible equipment.

Declining prices for data communications equipment overshadowed strong gains in shipments. Last year, worldwide sales of modems, multiplexers, network controllers and other gear declined 13% to \$15.4 billion. Typical of the market carnage was the bloodbath in the modem business. Modem makers played chicken with each other—some on-line data services and software companies gave away 2,400-baud modems to attract new subscribers. Last year, retail modem prices declined 30 to 50%, depending on the speed, according to Dataquest Inc. of San Jose. Motorola Inc.'s datacom business was one of many to take a hit—a 2% decline in revenues and a 13% decline in profits. IBM suffered a 32% decline in datacom revenues.

Nowhere is the maturation of the computer industry more obvious than in the personal computer market. Direct marketing of a product is a sure sign of a commodity business, which in itself is one of the criteria for a mature market. Upstart vendors CompuAdd Computer Corp., Dell Computer Corp., Gateway 2000 Inc. and Zeos International Ltd. climbed into the North American DATAMATION 100 on the backs of Compaq, IBM and other more-established players. PC revenues were up 7.5% for the worldwide DATAMATION 100 members this year, although unit shipments grew faster thanks to dramatically declining prices, according to the Framingham, Mass.-based market research firm International Data Group.

Heightened competition in the PC arena is starting to infect the workstation business. The business may still be exhibiting strong growth—workstation sales of the worldwide DATAMATION 100 jumped 27.4% to \$13.5 bil-

lion last year. And Big Blue's workstation revenue leaped 40% thanks to its RISC box, the RS/6000. But the workstation arena is rapidly becoming a commodity market driven by price. HP's "Save \$5. Gain 14MIPS" ads are typical of the price wars that are rapidly maturing the market from its narrow niche in scientific circles to a broader commercial realm. Sun Microsystems Inc. managed to retain first place in terms of revenue despite the furious attacks by HP and IBM.

Innovations like RISC, open systems and the client/server architecture show that the computer industry, although maturing, isn't dead yet. In fact, the Commerce Department predicts that software and services will grow at double-digit rates for the rest of the decade. In the not too distant future the combined software and services revenues of the DATAMATION 100 will exceed those of the hardware sectors.

Indeed, the growth achieved by the DATAMATION 100 during the past decade is

Big Exporters In North America

The North American companies with the most IS sales outside their home market.

	COMPANY	NORTH AMERICA	EUROPE	ASIA PACIFIC	OTHER
1	IBM	26,392.8	25,136.0	8,797.6	2,513.6
2	Digital	5,410.4	6,549.4	2,278.0	0.0
3	Hewlett-Packard	4,719.4	3,968.6	2,037.9	0.0
4	Unisys	4,080.0	2,400.0	1,520.0	0.0
5	Apple	3,897.6	1,883.8	714.6	0.0
6	AT&T	6,208.4	1,470.4	245.1	245.1
7	Compaq	1,341.3	1,635.7	229.0	65.4
8	Sun	1,692.8	1,036.4	725.5	0.0
9	Xerox	1,465.0	966.9	146.5	351.6
10	Microsoft	1,115.2	682.8	295.9	182.1

All revenue figures in \$ millions

remarkable. In the less than 50 years since the invention of the transistor at AT&T Bell Laboratories ushered in the modern electronics era, the leading computer companies have grown to the point where their revenues collectively exceed those of industries that are centuries old. This achievement should come as some consolation to the industry, and should provide industry officials with some solace as they face the deceleration of the industry's growth. Unlike Peter Pan, everyone has to grow up. ■

Larry Marion, a former assistant managing editor of DATAMATION, is an editor and writer based in Newton, Mass.

1991 IN PERSPECTIVE

Global Leaders

The top 15 companies worldwide in each of nine product segments. North American companies are in bold.

Large-Scale Systems

COMPANY	REVENUE (\$MIL.) 1991	1990	% CHANGE	MARKET SHARE*
1 IBM	9,100.0	10,632.0	-14.4%	33.1%
2 Fujitsu	4,446.1	2,843.1	56.4%	16.2%
3 Hitachi	3,501.9	3,412.2	2.6%	12.7%
4 NEC	3,063.5	2,593.6	18.1%	11.1%
5 Amdahl	987.2	1,360.0	-27.4%	3.6%
6 Nihon Unisys	965.4	951.0	1.5%	3.5%
7 Siemens Nixdorf	964.4	1,018.5	-5.3%	3.5%
8 Unisys	850.0	1,016.0	-16.3%	3.1%
9 Groupe Bull	830.2	825.4	0.6%	3.0%
10 Cray	682.0	590.2	15.5%	2.5%
11 ICL	582.0	392.0	48.5%	2.1%
12 Control Data	300.0	265.0	13.2%	1.1%
13 Compax	285.9	249.4	14.6%	1.0%
14 AT&T	200.0	N/A	N/A	0.7%
15 Mitsubishi	198.3	150.8	31.5%	0.7%

* Percentage share of DTM100 revenues.
N/A = Not applicable

Workstations

COMPANY	REVENUE (\$MIL.) 1991	1990	% CHANGE	MARKET SHARE*
1 Sun	2,455.3	1,934.0	27.0%	18.2%
2 IBM	1,400.0	1,000.0	40.0%	10.4%
3 Fujitsu	1,353.2	865.3	56.4%	10.1%
4 Digital	1,250.0	1,250.0	0.0%	9.3%
5 Hewlett-Packard	1,055.0	920.0	14.7%	7.6%
6 Matsushita	1,013.8	848.1	19.5%	7.5%
7 Intergraph	616.0	344.7	78.7%	4.6%
8 C. Itoh	594.8	558.3	6.5%	4.4%
9 Silicon Graphics	550.0	414.6	32.7%	4.1%
10 Prime	379.2	405.3**	6.4%	2.8%
11 Toshiba	319.7	285.9	11.8%	2.4%
12 Hitachi	312.3	192.1	62.6%	2.3%
13 Xerox	310.0	310.0	0.0%	2.3%
14 Dell	222.5	N/A	N/A	1.7%
15 Siemens Nixdorf	211.0	154.3	36.7%	1.6%

* Percentage share of DTM100 revenues.
** Restated figure
N/A = Not applicable

Midrange

COMPANY	REVENUE (\$MIL.) 1991	1990	% CHANGE	MARKET SHARE*
1 IBM	5,870.0	5,801.0	1.2%	26.5%
2 Digital	2,730.0	2,830.0	-3.5%	12.3%
3 Fujitsu	2,609.7	1,668.8	56.4%	11.8%
4 NEC	1,838.1	1,482.0	24.0%	8.3%
5 Toshiba	1,332.1	1,239.0	7.5%	6.0%
6 Unisys	945.0	1,100.0	-14.1%	4.3%
7 Siemens Nixdorf	934.3	925.9	0.9%	4.2%
8 Hewlett-Packard	832.0	732.0	13.7%	3.6%
9 Tandem	790.0	770.0**	2.6%	3.6%
10 AT&T	550.0	150.0	266.7%	2.5%
11 Hitachi	513.0	398.6	28.7%	2.3%
12 Mitsubishi	484.8	490.0	-1.0%	2.2%
13 Olivetti	478.6	526.6	-9.1%	2.2%
14 Stratus	367.7	403.9	-9.0%	1.7%
15 Groupe Bull	355.8	317.5	12.1%	1.6%

* Percentage share of DTM100 revenues
** Restated figure

Software

COMPANY	REVENUE (\$MIL.) 1991	1990	% CHANGE	MARKET SHARE*
1 IBM	10,524.0	9,952.0	5.7%	31.5%
2 Fujitsu	2,513.0	1,607.0	56.4%	7.5%
3 Microsoft	2,045.9	1,323.0	54.6%	6.1%
4 NEC	1,761.5	1,358.5	29.7%	5.3%
5 Computer Associates	1,437.8	1,310.7	9.7%	4.3%
6 Oracle	1,085.0	1,002.0**	8.3%	3.2%
7 Siemens Nixdorf	964.4	925.9	4.2%	2.9%
8 Hitachi	959.1	798.1	20.2%	2.9%
9 Lotus	828.9	642.2**	29.1%	2.5%
10 Digital	796.0	810.0	-1.7%	2.4%
11 Sema Group	640.5	533.4	20.1%	1.9%
12 Novell	632.6	388.1	63.0%	1.9%
13 Olivetti	630.8	621.3	1.5%	1.9%
14 ICL	625.6	492.0	27.1%	1.9%
15 Finsiel	609.4	490.0	24.3%	1.8%

* Percentage share of DTM100 revenues.
** Restated figure

Personal Computers

COMPANY	REVENUE (\$MIL.) 1991	1990	% CHANGE	MARKET SHARE*
1 IBM	8,505.0	9,644.0	-11.8%	19.3%
2 Apple	4,900.0	3,845.8	27.4%	11.1%
3 NEC	4,135.8	3,211.1	28.8%	9.4%
4 Compaq	3,271.4	3,598.0	-9.1%	7.4%
5 Fujitsu	2,319.7	1,419.6	63.4%	5.3%
6 Toshiba	2,093.5	1,953.7	7.2%	4.7%
7 Olivetti	1,566.1	1,791.7	-11.5%	3.6%
8 Unisys	1,061.0	1,181.0	-10.2%	2.4%
9 Intel	1,050.0	980.0	7.1%	2.4%
10 Commodore	1,038.5	995.7	4.3%	2.4%
11 AT&T	950.0	700.0	35.7%	2.2%
12 Groupe Bull	889.5	1,142.9	-22.2%	2.0%
13 Hitachi	825.3	718.4	14.9%	1.9%
14 AST Research	800.7	516.2	55.1%	1.8%
15 Tandy	750.0	850.3	-11.8%	1.7%

* Percentage share of DTM100 revenues

Peripherals

COMPANY	REVENUE (\$MIL.) 1991	1990	% CHANGE	MARKET SHARE*
1 IBM	10,278.0	12,405.0	-17.1%	17.0%
2 Hewlett-Packard	4,370.0	3,820.0	14.4%	7.2%
3 Canon	3,139.0	2,399.8	30.8%	5.2%
4 Hitachi	3,092.9	2,824.6	9.5%	5.1%
5 Fujitsu	2,996.3	1,916.0	56.4%	5.0%
6 Digital	2,900.0	3,000.0	-3.3%	4.8%
7 Seagate	2,668.7	2,667.6	0.0%	4.4%
8 Matsushita	2,179.6	1,823.4	19.5%	3.6%
9 NEC	2,144.5	1,729.0	24.0%	3.6%
10 AT&T	2,100.0	150.0	1,300.0%	3.5%
11 Siemens Nixdorf	1,733.0	1,944.4	-10.9%	2.9%
12 Conner Peripherals	1,599.0	1,337.5	19.6%	2.6%
13 Apple	1,346.0	1,722.0	-21.8%	2.2%
14 Oki	1,247.1	1,141.3	9.3%	2.1%
15 Xerox	1,200.0	1,100.0	9.1%	2.0%

* Percentage share of DTM100 revenues

Data Communications

COMPANY	REVENUE (\$MIL.)	REVENUE (\$MIL.)	%	MARKET
	1991	1990	CHANGE	SHARE*
1 IBM	2,000.0	2,950.0	-32.2%	13.1%
2 AT&T	1,790.0	1,465.0	22.2%	11.8%
3 NTT	1,495.4	1,230.3	21.5%	9.8%
4 Northern Telecom	1,460.0	1,220.0	19.7%	9.6%
5 Matsushita	1,267.2	1,080.1	19.5%	8.3%
6 Ricoh	892.2	837.4	6.5%	5.9%
7 Racal	679.0	625.2	8.6%	4.5%
8 Toshiba	639.5	571.8	11.8%	4.2%
9 Fujitsu	579.9	370.8	56.4%	3.8%
10 Mitsubishi	550.9	492.0	12.0%	3.6%
11 Hewlett-Packard	450.0	400.0	12.5%	3.0%
12 Hitachi	408.9	386.7	5.7%	2.7%
13 British Telecom	391.5	372.9	5.0%	2.6%
14 Unisys	380.0	425.0	-10.6%	2.5%
15 Xerox	380.0	380.0	0.0%	2.5%

* Percentage share of DTM100 revenues.

Services

COMPANY	REVENUE (\$MIL.)	REVENUE (\$MIL.)	%	MARKET
	1991	1990	CHANGE	SHARE*
1 EDS	3,666.1	2,870.0	27.7%	11.3%
2 Andersen Consulting	2,083.0	1,670.2**	24.7%	6.4%
3 IBM	2,018.0	1,500.0	34.5%	6.2%
4 CSC	1,944.7	1,679.3	15.8%	6.0%
5 TRW	1,839.0	1,739.0	5.8%	5.7%
6 ADP	1,810.0	1,736.0**	4.3%	5.6%
7 Digital	1,570.3	1,162.3	35.1%	4.9%
8 Fujitsu	1,546.5	988.9	56.4%	4.8%
9 Cap Gemini	1,492.1	1,465.9	1.8%	4.6%
10 NTT	996.9	883.7	12.8%	3.1%
11 American Express	995.0	827.0	20.3%	3.1%
12 Price Waterhouse	733.0	583.0**	25.7%	2.3%
13 Nomura	706.3	652.3	8.3%	2.2%
14 General Electric	650.0	600.0	8.3%	2.0%
15 PRC	622.8	632.4	-1.5%	1.9%

* Percentage share of DTM100 revenues.

** Restated figure

Maintenance

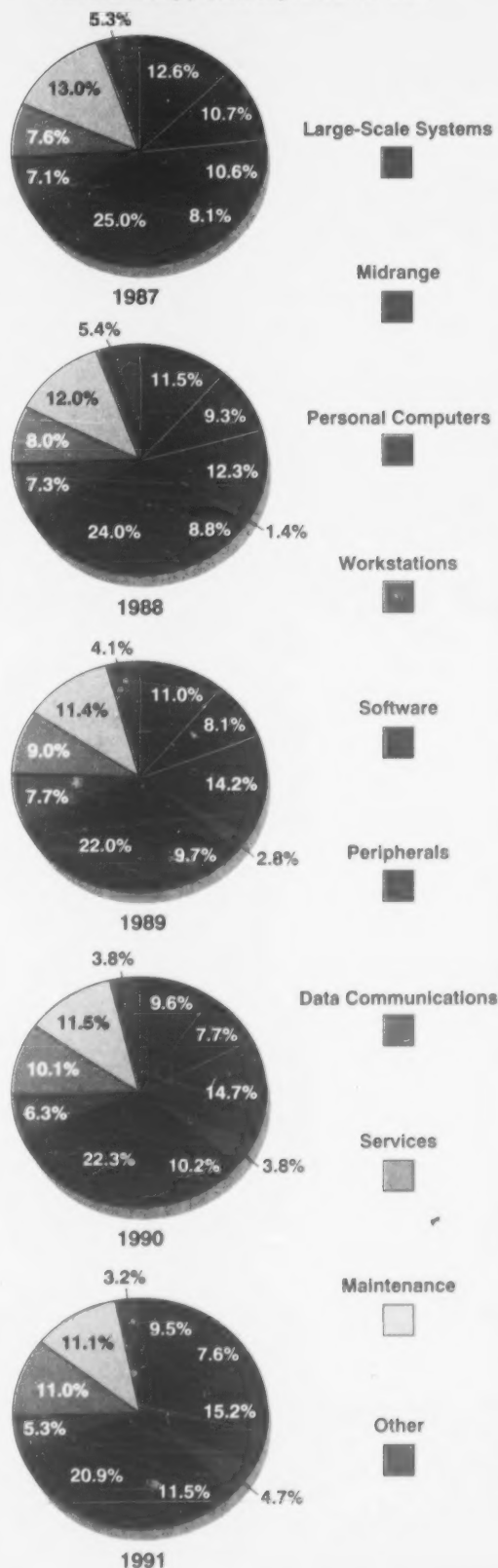
COMPANY	REVENUE (\$MIL.)	REVENUE (\$MIL.)	%	MARKET
	1991	1990	CHANGE	SHARE*
1 IBM	7,414.0	7,768.0	-4.6%	22.9%
2 Digital	4,421.5	3,450.0	28.2%	13.7%
3 Hewlett-Packard	2,959.0	2,503.0	18.2%	9.2%
4 Unisys	1,844.0	1,990.0	-7.3%	5.7%
5 AT&T	1,729.0	200.0	764.5%	5.3%
6 Siemens Nixdorf	1,446.7	1,654.9	-12.6%	4.5%
7 Groupe Bull	1,363.9	1,333.4	2.3%	4.2%
8 Olivetti	1,094.5	1,106.6	-1.1%	3.4%
9 Fujitsu	966.5	618.1	56.4%	3.0%
10 NEC	892.2	741.0	20.4%	2.8%
11 Xerox	820.0	820.0	0.0%	2.8%
12 Wang	818.0	994.0	-17.7%	2.5%
13 ICL	752.2	669.0	12.4%	2.3%
14 Prime	575.0	635.6	-9.5%	1.8%
15 Bell Atlantic	495.0	432.0**	14.6%	1.5%

* Percentage share of DTM100 revenues.

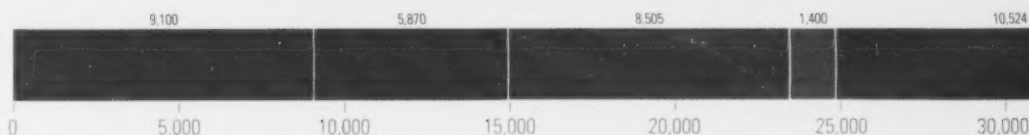
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Five-Year Perspective

Market share by product segment since 1987.



1 IBM
\$62.840 B



■ LARGE-SCALE SYSTEMS ■ MIDRANGE ■ PCs ■ WORKSTATIONS ■ SOFTWARE ■ PERIPHERALS ■ DATACOM ■ SERVICES ■ MAINTENANCE ■ OTHER

THE NORTH AMERICAN TOP 25

Microsoft rockets nine places; Amdahl skids five.
Sun breaks into the top 10, StorageTek joins the crowd.

2 DIGITAL \$14.238 B



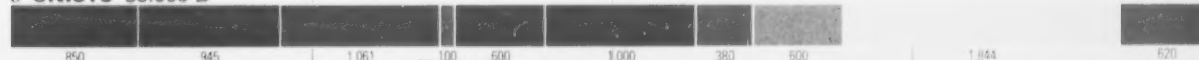
3 HEWLETT-PACKARD \$10.726 B



4 AT&T \$8.169 B



5 UNISYS \$8.000 B



6 APPLE \$6.496 B



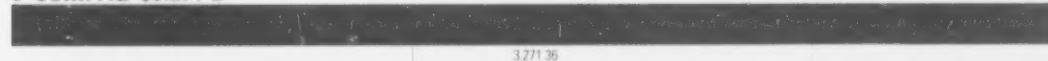
7 EDS \$3.666 B



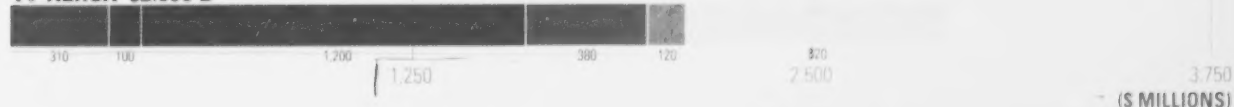
8 SUN \$3.455 B



9 COMPAQ \$3.271 B



10 XEROX \$2.930 B



NORTH AMERICAN COMPANIES



11 SEAGATE \$2.669 B



12 MICROSOFT \$2.276 B



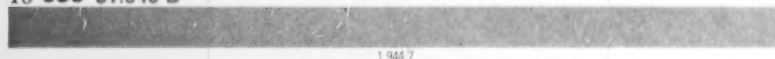
13 ANDERSEN CONSULTING \$2.260 B



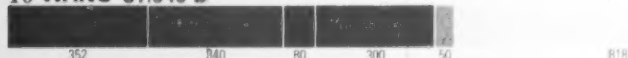
14 TRW \$1.945 B



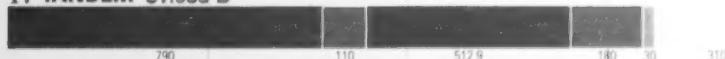
15 CSC \$1.945 B



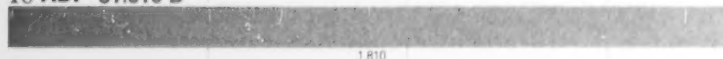
16 WANG \$1.940 B



17 TANDEM \$1.933 B



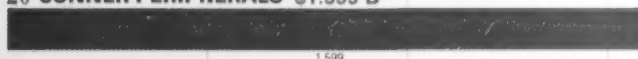
18 ADP \$1.810 B



19 AMDAHL \$1.702 B



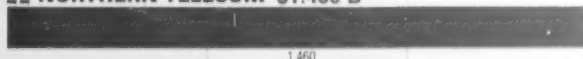
20 CONNER PERIPHERALS \$1.599 B



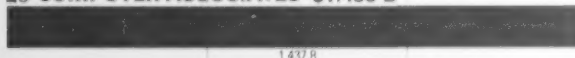
21 STORAGETEK \$1.585 B



22 NORTHERN TELECOM \$1.460 B



23 COMPUTER ASSOCIATES \$1.438 B



24 PRIME \$1.382 B



25 DATA GENERAL \$1.212 B



IBM's Kuehler:

We're Going To Be Different

The president of IBM discusses industry trends, Big Blue's reorganization, SAA and the PC business.



Last year was a time of momentous change for the world's largest computer company. Posting its first ever net earnings loss in 1991, IBM announced a sweeping reorganization that will eventually enable the company to operate as 14 loosely coupled entities that IBM hopes will be able to respond faster and more effectively to customer needs. But how does IBM get from stated intention to effective implementation? What are the beliefs and thoughts among senior management to justify the path and the pace of change IBM has chosen? And what effect will the changes have on its most important customer base, the heartland IS organizations in the world's largest commercial enterprises? To answer these and other questions, IBM president Jack D. Kuehler met recently to discuss events at IBM with DATAMATION editor-in-chief David R. Brousell and senior writer Jeff Moad. The following are excerpts from the interview in Kuehler's office at IBM corporate headquarters in Armonk, N.Y.

THE DATAMATION 100

EXCLUSIVE

Q: *Do you believe there's a fundamental technological and economic model shift under way in the industry that's affecting IBM, or was 1991 just an aberration?*

A: I think what has been going on in the past in our industry is just continuing at a much faster pace. I don't have to tell you that my company and others in the industry are engaged in global competition. It's a well-used phrase, but it's really true. And what it means is thousands of competitors, rather than hundreds of competitors, for all of us. What that means is you don't have the luxury of delaying the [introduction] of your new technology to the marketplace because you're not the only game in town. There are thousands of other games. This you could describe as a shift. I would describe it as continuing evolution at a faster pace.

Q: *The price per MIPS at the desktop is in the range of \$1,000 now, whereas the price per MIPS at the mainframe is \$40,000 to \$50,000. Is this discrepancy between the perceived value of desktop and mainframe platforms a major hurdle that you've got to address?*

A: I don't agree with the delta that you have described of A40 versus 1....But I do agree there's a delta. And I do agree that there is a major set of factors causing our customers to take advantage of this new hardware and software opportunity called intelligent workstations....[But] when you think of mainframes, we talk in terms of 99% availability, 24 hours a day. And we think of thousands of workstations [that] sit there and do nothing for two shifts....

Although I think there are many more new applications being written for the intelligent workstation, there are also new applications being defined for what you call the mainframe. And those are as data servers in a large central database, as a server in a local area network, as the manager of a complex communications network....And our customers are telling us that they still require that software, which is what I think of when I think of mainframes, not the hardware. That complex software presiding over that set of resources....

So, to me it isn't an either/or. There is a lot of good business in front of us, we believe, for our mainframe systems, defined as the software.

Q: *So you're thinking of desktop technology as complementing rather than replacing the mainframe?*

A: I'm looking at it as complementary....[But] when I think of the mainframe, I don't think of the hardware. I think of the software enabling those resources to accomplish requirements that a customer has. And I would not be sur-



There is a lot of good business in front of us for our mainframe systems; defined as software.

prised if you didn't see workstation technology—hardware technology—over time become more and more of the underpinnings of that high-end software. There is nothing that says that you cannot accomplish the objectives of MVS/ESA with workstation technology....And we're working down that path.

Q: *The organizational changes you've made at IBM recently are in some ways dramatic. Some observers, however, say it's too little too late. Is it?*

A: I'm sure you can find somebody who has a different point of view on all bounds. We are very, very happy with the structural changes we've made. The changes inside of our company as a result of doing these are remarkable. And we have lots of customers' input that says we're on the right course and speed....

The real question is do we believe we're doing the right thing? We really do. This organization was driven personally by John Akers down the track of improving our responsiveness to customers in the marketplace, to speeding up decision making, to simplifying measurements, so that smaller organizations could really charge the mountain and achieve well-defined goals....And it's marvelous to watch what's happening. These businesses, for the first time I can recall, in some cases have said: "We have too many resources to meet our measurements. We are going to spend less capital." And, most importantly, [they] have given us plans where they intend to reduce their assets....The delegation of decision making is real. And I almost need to read the papers to find out what we're doing.

Q: *Some IS executives tell us they're concerned that, as IBM decentralizes, they'll lose their constant, unified interface to the company. Will that happen?*

A: That was one of John Akers's very strong considerations to retaining one sales force. In the past, IBM's had multiple forces. [Now] we have one. One in the U.S., one in Europe, etc., to maintain a consistent, common face to the customer. There'll be modest deviations from that. For example, our Pennant printer organization has a small, specialized sales force. But, by and large, John Akers wants to retain one face to the customer for that specific reason.

Q: *Under the new organization, will IBM's product groups continue to coordinate their activities? To what extent can IBM continue to enforce Systems Application Architecture, for example?*

A: Let me tell you what's happening. AdStar, the storage products organization...has realized that the IBM cus-

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tomer set is their largest customer and they [AdStar] need them [internal customers] to meet their objectives. Therefore, it's very important that they [AdStar] become unusually attentive to the personal systems team...so that the personal systems team won't go off and use somebody else's disk files....Their interface to their customers inside IBM has improved as a result of their belief that that's [their] biggest customer. It would be very foolish if they didn't satisfy them. So we're having, for now, the [desired] effect in terms of cooperation across the company....

SAA remains our principal focus to define the internal interfaces between MVS, VM, OS/400 and OS/2, as well as the interoperability across those platforms....We have an [SAA] organization that has not changed as a result of this reorganization under Dr. Mike Saranga. He and his teams are the architects. They work for Earl Wheeler, and they have two other teams, a total of...85 people whose role in life is to ensure that we maintain consistency and appropriate direction down that path.

Q: So, do the lines of business have the option of being part of the SAA scheme or not?

A: It's an option that they can decide to take. But there will be major visibility should they decide to take it, and it may very well be that that's one of the requirements that the management will now deal with, maintaining some consistency that's appropriate...a super empowerment over the empowerment of the individual organizations....[But] we haven't seen any—to my knowledge—people electing to take advantage of their newfound responsibilities and going south on SAA, because it offers advantages to their financial equation to remain a part of that.

Q: What's IBM doing to improve the profitability of its PC business?

A: One of the things that we're working on [is] to increase the turns. That's not something that we have had as a principal focus in years gone by....We're also redefining our distribution systems. A large part of the profitability opportunity is in how you distribute. We're also...redefining...higher priced models, lower priced models and, in Europe, we have a non-IBM-labeled set of products. So we can participate in the whole distribution system and deal

with price pressures differently....And we're also refocusing on what we should develop for ourselves and what we should have others develop for us so that we can preserve our...expenses, our people, for the higher-value opportunities.

Q: Is the reorganization leading IBM any closer to changing its no-layoff practice?

A: The intent of this organizational concept is to provide a financial profile that achieves the objectives we [have] described....That's what we're all trying to do. How we get there will be defined day to day, as we go down the road. But we're going to get there.

Q: For many years IBM has been seen as a symbol of American competitiveness, particularly against highly integrated global competitors. Will that continue to be true as IBM goes through the process of reorganizing into several autonomous business units?

A: One of the foundations...of your questions is a healthy, strong company. It may change in terms of its makeup, but it must remain healthy and strong to provide the image you've described. And, not only the reorganizations but the other things we're doing [will keep IBM healthy and strong]. The alliances, the ability to share in the development of our technology and share in the capital as we've done with Siemens...that will allow us to continue spending at the rate necessary to remain the leader in DRAMs, which we've been for four generations. The ability to share in terms of creative people...that we are doing with the Apple alliance....The ability to share with Motorola in both the development and the manufacture of our RISC microprocessors....

I think, in fact, the IBM company...is larger and, we believe, stronger. And, therefore, that fundamental underpinning is going to get better, not worse....But we're going to be different....People say, "Will the IBM company change?" Would these same people have believed three years ago that we would have 40 Siemens engineers working in our top secret laboratories, designing in concert with us and manufacturing in concert with us our semiconductor processors and DRAMs? Would they have believed we would have had these alliances with Apple that we currently have? If you just step back and look at what we're doing, I challenge people to even ask the question, "Will IBM change?" We are changing. I hope you agree with that. ■



INTERVIEW



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IS Revenue
\$62.84 Billion



NORTH AMERICAN COMPANIES

INTERNATIONAL BUSINESS MACHINES CORP.

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They used to say that when IBM sneezes, the rest of the computer industry catches a cold.

The implication was that so pervasive was IBM's influence, the repercussions of even a minor problem at Big Blue would ripple throughout the industry. It also suggested that so robust was IBM that events which could bring its competitors to their knees would barely be felt in Armonk.

But you don't hear that old saying much anymore. That's because in 1991 IBM lost its patina of invincibility, along with any immunity it may once have had to forces like recession and fierce competition. In the wake of economic hard times, IBM became every bit as sick as any of its major competitors.

What's more, as large user organizations embraced concepts such as downsizing, open systems and client/server computing, IBM found itself no longer the single, centrifugal force in the information technology industry.

"For a few of our core applications, IBM is still the dominant player. They're still as critical as they ever were," says Jack Hancock, the chief information officer at Pacific Telesis Group in San Francisco. "But the issue of moving some applications off the mainframe and onto other platforms is very real. And, in that area, I just have a lot of alternatives to IBM. I believe that, for the first time, IBM management does understand that they've got an enormous problem on their hands."

If chief executive officer John F. Akers and company didn't understand that before, IBM's 1991 finan-

cial results certainly brought the point home. IBM reported its first-ever loss in 1991 and saw total corporate revenue decline by 6.1% to \$64.79 billion. IBM's net loss of \$564 million did not include a \$2.263 billion charge for a required accounting change. Taken together, they brought IBM's 1991 total loss to \$2.83 billion.

Lurking behind the bottom line numbers was more bad news. IBM's equipment sales—its fundamental hardware business—dropped 15.6% in 1991, with large-processor revenue dropping 9%. Personal computer revenue dropped even further. Revenue from what IBM calls personal systems—the PS/1, PS/2 and RS/6000—fell 11.8% in 1991. In fact, the PS line did even worse than that, since IBM has separately reported that RS/6000 revenues in 1991 rose by 60%. Revenue from IBM's usually strong storage business was also a weak spot, falling 19.9% from 1990 levels.

There were some bright spots for IBM in 1991. IBM's nonmaintenance services revenues were up a booming 34.5%, thanks to the company's successes in the growing outsourcing and systems integration markets.

Large-system revenue began to pick up late in the year, as IBM completed its transition to the new S/390 architecture with the shipment of its largest ES/9000 model 820 and 900 mainframes. Although IBM officials have stopped short of predicting double-digit mainframe revenue growth in 1992, enterprise systems general manager and corporate vice president Nicholas M. Donofrio has said IBM is sold out of ES/9000's into the second quarter of this year.

IBM's revenue from software also grew in 1991, although not as rapidly as in the past. Software revenue, at \$10.5 billion, was up 5.7%. IBM's software revenue grew 18.1% in 1990.

But modest strength in its software, services and mainframe business was too little, too late for IBM. By early in 1992, the financial markets had reacted to IBM's awful year

by stripping the company of its prized Moody's AAA credit rating and driving its stock price to a 10-year low.

CEO Akers reacted in the time-honored IBM fashion—he reorganized, creating eight product businesses and three service businesses, in December 1991, all acting relatively autonomously. The idea, according to Akers, was to free IBM's lines of businesses from the company's often stifling bureaucracy and to turn IBM into what he called "a network of more competitive businesses."

But Akers didn't stop there. After having publicly vented his rage over IBM's productivity problems, Akers placed many of the newly reorganized businesses in the hands of a set of relatively young (45- to 50-year-old) IBM executives. At the same time, he engineered the departure from the company of several of his top lieutenants, more than one of whom, at one time or another, had been thought to be in line to become chairman. Among those leaving the company were top marketing chief George M. Conrades and senior vice president C. Michael Armstrong.

Akers also intensified what has amounted to a five-year effort at IBM to cut operating costs, primarily by reducing head count. Mainly through voluntary early retirement programs, IBM has cut its employee rolls by 62,604 since 1986. In 1991 alone, IBM trimmed 29,000 names from its payroll. That 7.8% cut reduced the staff to 344,396.

Costs related to its restructuring and downsizing resulted in a \$3.4 billion one-time charge, which helped push IBM's 1991 financial results into the red. Before those charges and taxes, IBM had an operating profit of about \$4 billion in 1991.

Some of IBM's largest customers have expressed mixed reactions to the organizational changes being forced on IBM. At this early date, they have seen little evidence that IBM's newly autonomous business units are responding more quickly with better



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new products. Rather, many worry that the new, "networked" IBM may become more difficult—and more expensive—to deal with. For example, customers such as Ben Parke, chief information officer at textile manufacturer Burlington Industries Inc., say that they're being asked to pay for support services that IBM had once provided free of charge.

"I don't like it, but I understand it," says Parke.

Other users worry that as IBM splits into autonomous entities they'll have to manage relationships with more than one IBM. "It's the same problem we faced back in the 1970s when IBM created the GSD [General Systems Division], and there were multiple sales groups. We don't want to see that again," says Pacific Telesis's Hancock.

IBM officials, however, insist the restructuring will make IBM more responsive and productive without sacrificing the company's relationship with its customers. IBM has taken care to retain a single sales organization so as to present a unified face to customers, IBM president Jack Kuehler told DATAMATION in a recent interview.

"This organization was driven personally by John Akers down the track of improving our responsiveness to customers in the marketplace, to speeding up decision-making, to simplifying measurements so that smaller organizations could really charge the mountain and achieve well-defined goals," says Kuehler. "We are very, very happy with the structural changes we've made."

Its organization wasn't the only thing IBM changed about the way it does business. In 1991, the company struck what for it were some unusual alliances. Big Blue strengthened its relationship with network kingpin Novell Inc., for example, and even entered into a broad-based product development relationship with long-time PC rival Apple Computer Inc., which could result in significant new desktop hardware and software technologies.

By the end of the year, there were signs that the cost cutting and a modest economic recovery were beginning to improve IBM's financial performance. The company reported revenues 3.3% and earnings 7%, higher in the first quarter of 1992 than they had been in the same quarter of 1991, excluding extraordinary charges.

IBM executives aren't assuming the company is suddenly out of the woods, however. IBM's disappointing 1991 results represent more than just a temporary, recession-related dip, and the changes at IBM so far are probably just the beginning. —Jeff Moad



IS Revenue **\$14.24 Billion**

DIGITAL EQUIPMENT CORP.

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Digital Equipment Corp. executives would prefer to forget 1991. For the first time in its 35-year history, the Maynard, Mass., company suffered an operating loss: in its second 1992 fiscal quarter, which ended in December 1991, Digital lost \$138.3 million on revenue of \$3.47 billion. And although calendar year 1991 revenue grew 8.9% to \$14.24 billion, a net loss of \$864.4 million—most of it in planned restructuring charges—was a bitter pill to swallow.

Both Digital and its customers blame its poor showing on unnaturally low demand for its larger systems due to the poor economy. Says Bill Brindley, president of the loyal Digital user group DECUS: "If the economy had been surging and booming, I think Digital would have done very well."

Digital officials, however, also point to another factor: the growing tendency of customers to purchase so-called open systems and software and to the user community's perception that

Digital sells proprietary solutions. Says vice president of corporate marketing Bill Johnson: "A perception existed around Digital as not being open....By and large, we were as open as anyone else, but the perception was what mattered."

Digital took several aggressive steps to alter that perception last year. It moved toward user-based, rather than system-based, software pricing. It encouraged its staff to be more open with customers. And it began shipments of open products such as a POSIX-compliant version of its VMS operating system. In February 1992, Digital gave proof to its claims of openness when officials announced it will license its VMS operating system, now called Open VMS, to other vendors.

At the same time, Digital took much-needed steps to compete in the high-stakes price/performance hardware contest. Not only did Digital announce one of the lowest-cost workstations in the industry, the \$3,995 Personal DECstation 5000 model 20, but it also made a strategic commitment to the price/performance-sensitive PC local area network marketplace with new Intel 486-based PCs. It started a multivendor PC integration business unit and added robust capabilities, such as support for Novell NetWare, to its Pathworks LAN software products. Says Kevin O'Neill, an analyst with the Business Research Group in Newton, Mass.: "Digital recognized that PCs are not just attachments to the VAX, but are viable business systems [on their own]."

In fact, the company took a cue from successful PC mail-order vendor Dell Computer Corp. and founded its own Desktop Direct PC mail order program, which has spurred sales of its PCs.

Most important, however, Digital put its still-considerable muscle behind new 64-bit reduced instruction set computing chips and systems, code-named Alpha. At 200 megahertz, the first Alpha chip, the 21064, ran twice as fast as any other RISC pro-



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cessor on the market last year. Digital plans eventually to introduce Alpha-based systems ranging from palmtops to supercomputers. The systems will run not only VMS and OSF/1 but also Microsoft Corp.'s NT operating system, in a move designed to appeal to millions of existing DOS and Windows users.

Digital won't make the chips available in volume until late this summer and won't introduce Alpha systems until later in 1992. The company can't gain significant Alpha revenues until 1993 or even 1994, and thus, this year's financial performance is unlikely to change dramatically. And, while analysts laud the Desktop Direct program, low profit margins on PCs are unlikely to drag Digital out of its financial swamp.

In fact, Digital sank deeper into the financial abyss this year, announcing a shocking \$294.1 million loss for the first quarter of calendar 1992, prompting analysts to forecast thousands more layoffs. Digital officials themselves say they don't expect financial performance to improve this year. Still, executives manage to convey high hopes that the next generation of technology will turn the company around. Says Johnson: "As a strategic product for the future, Alpha will be to Digital what the VAX was in the '80s."

—Elaine L. Appleton

IS Revenue
\$10.73 Billion



NORTH AMERICAN COMPANIES

HEWLETT-PACKARD CO.

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Palo Alto, CA 94304
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Unlike many of its competitors, Hewlett-Packard Co. emerged from 1991 on something of a roll.

In fact, thanks to continued strength in its desktop-printing and

multiuser UNIX systems and the introduction last year of new, aggressively priced workstations, HP managed to increase its IS equipment and services revenues enough to overtake Unisys Corp. and become the third largest North American vendor.

Although the worldwide recession curtailed what in 1990 had been rapid HP revenue growth in Europe, the company managed to report a 12.7% increase in computer-related revenues to \$10.73 billion for 1991. And overall corporate profits rose a healthy 11% to \$856 million, a far cry from the previous year's 11% drop.

"We've now moved into the No. 3 position as a computer company....So now we can set our sights on No. 2," proclaims HP Computer Systems organization executive vice president Lew Platt.

Catching up with long-time rival Digital Equipment Corp. won't be easy. But the company did manage to continue its momentum into early 1992, growing computer revenues 17.8% and corporate net earnings by a surprising 49% in the first fiscal quarter, ending January 31.

Fueling HP's 1991 growth, as it has for several years, was the company's desktop printer business. HP started shipping its new LaserJet III in volume early in 1991, and already the product has captured a 75% market share, according to the La Jolla, Calif.-market research firm Computer Intelligence.

The multiuser UNIX business also continues to be a winner for HP. Platt says revenues from those products grew over 50% in 1991, following a 60% growth rate in 1990. Strong price/performance derived from improvements in HP's reduced instruction set computing (RISC) processor, plus industrywide interest in UNIX, has helped attract new users such as ITT Sheraton Corp., which is building a \$14 million reservations and property management system around the HP 9000 series 800 UNIX midrange system.

Key new product moves helped HP stem market share losses it had been suffering in the UNIX workstation business. HP jumped to the front of the workstation pack in March 1991 when it introduced the HP Apollo 9000 series 700 workstations and servers, which offered an eye-popping price/performance of \$1,000 per SPECmark. The announcement prompted key ISVs such as electronic design automation software vendor Cadence Design Systems Inc. and Lotus Development Corp. to announce plans to port their applications to the new HP workstations.

HP also made a successful push in 1991 to have several of its key products and technologies adopted as emerging industry standards. Many of the object management technologies pioneered in HP's NewWave graphical user interface were adopted as standards by the Object Management Group in 1991. And HP had similar success with its OpenView UNIX network management and Softbench CASE-integration technologies. Late in 1991, HP even moved to bring its proprietary MPE minicomputer operating system into the open systems world with a POSIX shell, which ships this month.

Going into 1992, HP's goals were little changed from those of a year earlier: improve overall financial results, achieve market share leadership in workstations and multiuser UNIX systems and push to have HP technologies adopted as standards. HP will also continue to squeeze better performance out of its PA-RISC architecture, Platt says. In addition to applying that increased power to its workstation line, HP plans to introduce larger symmetric-multiprocessing versions of its MPE/iX and multiuser UNIX systems, moving well into the mainframe performance area. As HP does so, Platt says, the company recognizes it will have to focus on developing technologies and service offerings that will allow it to coexist with mainframes.—Jeff Moad



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IS Revenue **\$8.17 Billion**

AMERICAN TELEPHONE AND TELEGRAPH CO.

550 Madison Avenue
New York, NY 10022
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After years of failed attempts to establish itself as a computer industry heavyweight, AT&T finally completed its protracted takeover of NCR Corp. last September. In a deal worth \$7.4 billion in AT&T stock, the telecommunications giant ended NCR's 107-year tradition as an independent supplier.

Critics who once predicted that AT&T's acquisition would be the kiss of death for NCR were somewhat muted last year. Long before the merger paperwork was completed in September, both companies made it perfectly clear who would be in charge of AT&T's computer business—NCR. "We are essentially running this computer business 100%, and have been since September of last year," says NCR chairman and chief executive officer Gilbert P. Williamson.

DATAMATION estimates AT&T/NCR's total IS revenue at \$8.17 billion for 1991. Computer revenue under NCR's control totaled \$6.34 billion and IS revenue still under AT&T's domain (primarily PBXs and modem revenues from its Paradyne subsidiary) is estimated at \$1.83 billion.

Despite time devoted to the merger, AT&T and NCR managed to hammer together logical product families, launch new products and sign big contracts through the year. Among the significant events were the following:

■ In March, Wal-Mart Stores Inc. agreed to buy NCR servers for use in over 800 retail stores.

■ In April, AT&T announced that it was selling off equity in its UNIX System Laboratories Inc. (USL) subsidiary, in a move that analysts say is

meant to stem user defection to the Open Software Foundation's OSF/1 environment. By the end of the year, the company says, it had divested itself of some 20 to 30% of USL to 11 computer industry investors in a private placement.

■ Also in April, NCR rolled out its Document Management System (DMS) enterprisewide imaging system, based upon the company's multiple microprocessor System 3000 family.

■ In May, NCR announced its most powerful system to date, the mainframe-class NCR System 3600.

■ In October, AT&T's post-merger network plans became better understood after NCR released a new set of products in support of its Open Networking Environment (ONE), the first product announcement from the combined company.

■ In December, database server company Teradata Corp. agreed to merge into AT&T. Ranked 78th on the 1991 DATAMATION North American 100, Teradata had joined with NCR in the development of its System 3000 family. Both companies decided to continue evolving their current product lines until 1993, when customers from both will be migrated to the forthcoming NCR System 3700.

Unfortunately, not everything went according to plan. After NCR's flagship System 3600 was announced in May, NCR pulled it back into the labs, having discovered some software glitches. As a result, the first sale didn't occur until this January, when a savings bank in Spain placed the first order. Williamson believes the delay resulted in financial slippage for NCR last year. "This six-month slip [in delivering the 3600] means that the ramp-up of deliveries is also six months later. When you move out your revenue plan by six months, it's going to have a significant impact," he says.

Another embarrassing incident followed last summer's glitzy launch of NCR's 3125 pen-based system in New York City. After claiming it would be

the first to ship such a system, NCR stumbled when the machine failed to be qualified by the Federal Communications Commission. The problem was finally solved well into 1992, but by then, major competitors were getting their systems out the door, too.

With NCR's System 3000 family now fully in place, AT&T is looking to this year and next to make a real impact on the computer industry. As potential customers warm up to the idea of scalable, multiprocessor-based systems as possible mainframe replacements, it may have its best shot ever at success.—Paul Pinella

IS Revenue **\$8.00 Billion**

UNISYS CORP.

Township Line and Union Meeting Roads
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For Unisys Corp., the long winter of its discontent may be ending.

The company's surprise fourth-quarter profit of \$80.5 million and its statement that it expects to be profitable for all of 1992, although on lower revenues, was the best news the company has had for several years. Since 1989, the big-computer maker, shouldering an enormous debt burden, has been bleeding profusely, losing a combined total of more than \$1 billion in 1989 and 1990.

Even though Unisys lost an additional \$1.4 billion overall in 1991, the fourth-quarter profit marked the beginning of what everyone at the company hopes is a sustainable turnaround. Financial analysts hope for the same thing, but also see challenges.

"At some point, by late '92 when the cost cutting levels off, it will be incumbent on Unisys to show moderate revenue growth or they're back in the soup again," says Stephen R. Weber,



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managing partner at the Cowen & Co. research house in Boston.

The need to restart revenue growth, which Unisys officials say they expect to do in 1993, follows a tough 1991, when Unisys literally overhauled itself to raise enough money to meet its debt obligations and refocus its development and marketing efforts on its core markets.

In June, Unisys sold its Timeplex Inc. communications division to Swiss telecommunications firm Ascom Holding AG for \$207 million. In July, the company announced a dramatic series of actions to reduce its costs and took a \$1.2 billion charge to do so. The write-off included \$925 million for what will amount to the reduction of 10,000 jobs by the middle of this year. That will reduce overall employment to 57,000 this year, less than half what it was when Burroughs Corp. and Sperry Corp. merged to form Unisys in 1986. The sum also includes \$275 million in a write-down of good will.

Unisys last year announced the closing of its Flemington, N.J., workstation-engineering and manufacturing plant; a check-processing equipment plant in Scotland; a mainframe-manufacturing plant in Clear Lake, Iowa; a semiconductor wafer-forging operation in Rancho Bernardo, Calif.; and a circuit board manufacturing operation in Salt Lake City. Overall, the company removed 20,000 items from its product catalog and also announced that it was capping its V Series mainframes.

The restructuring and asset sales, combined with recessionary and other pressures, resulted in a 14% corporate revenue decline to \$8.7 billion in 1991.

As part of its omnibus July announcement, Unisys refocused its global marketing strategy on four industry segments: financial services, airlines, communications and the public sector. "You just don't win a customer unless you provide a solution," explains chairman and chief executive James A. Unruh. "The technology alone isn't sufficient."

Meanwhile, as the structural and

financial picture played out, Unisys managers were busy on the product side of the house, and Unruh reengineered the company's management team. Unisys introduced new high-end models in the A Series and 2200 mainframe lines last year, the A 19 and the 2200/900, and it committed to standardizing on Intel-based workstations and servers.

In March, Unruh promoted Reto Braun, who had been an executive vice president of corporate marketing, to president and chief operating officer. In May, Unruh promoted Hugh Lynch, who joined Unisys from NCR Corp. in 1990, to executive vice president and president of the Computer Systems Product Group. And in July, he brought in William B. Patton Jr., former president and chief executive of MAI Basic Four Inc. and chairman of Parallax Computer Inc., to be senior vice president and head of U.S. Information Systems.

In the midst of all the changes, Unisys stepped up a quality improvement program, training some 25,000 employees by year's end. The program produced what Unruh says are "extremely good" marks from customers. "Customer satisfaction ratings have been rising steadily as we've been going through all this," says Unruh. "We've been hammering away at it continuously."

And the company seems to have gotten through to some key users. Tom Murphy, president of the user group Use Inc. and director of the large systems support department at the Navy Computer and Telecommunications Station in Newport, R.I., says he's encouraged by the changes at Unisys, in particular the financial improvement. "I expected them to pull out, and they did—they justified my optimism," says Murphy, who oversees the station's 2200 computers. "They've always had the technology. In restructuring, they did what the computer industry had to do, and they did it first."

—David R. Brousell

IS Revenue **\$6.50 Billion**

APPLE COMPUTER INC.
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During 1991, Apple Computer Inc. resolutely carried out its plan to sacrifice gross margins for market share. Overall, the company succeeded handsomely, increasing total revenues by 13% to \$6.50 billion, while net earnings dropped 35% to \$325 million.

But Apple's most surprising move of the year was the announcement of a long-term alliance with IBM, with the immediate goal of improved Macintosh-to-IBM networking through new products and cross-licensing agreements. This promptly bore fruit in the form of Token Ring and Integrated Services Digital Network (ISDN) cards and communications products to connect Macs to IBM's Systems Network Architecture (SNA) environment. And Apple executive vice president and chief financial officer Joseph Graziano says that "a whole suite of products is being developed." The next phase will be a line of Macintoshes powered by IBM's reduced instruction set computing-based PowerPC chips and an open-systems environment called PowerOpen (blending both Macintosh and IBM AIX software), due by the end of 1993.

Two joint ventures were also established last year between Big Blue and Apple: Kaleida Inc., focused on multimedia technologies; and Taligent Inc., focused on creating a completely object-oriented software development environment.

While slashing prices to keep up its market share, Apple did not sacrifice research and development funding, which continued to the tune of \$574 million for 1991, about 9% of total revenues.

Maintaining that level of R&D resulted in, among other things, the 68040-based high-performance Quadra



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Macintoshes, which were introduced last year at a price far more competitive than those of premium high-end Macs of the past. Also debuted was the 68030-powered Classic II compact Mac, which combines the CPU, monitor and keyboard all in one shell.

And Apple shipped the long-awaited System 7 operating system—fortunately with few bugs. Mac peripherals introduced in 1991 included low- and high-end laser printers and an ink jet printer, a scanner and a 21-inch color display. But Apple chairman and chief executive officer John Sculley singles out the PowerBook line of notebook computers, introduced last fall, as a major contributor to profits. He says 200,000 were sold by the end of March 1992.

In spring 1992 Apple brought out its first products aimed squarely at IBM PC users. These include a laser printer compatible with Hewlett-Packard Co.'s LaserJet, a scanner with software that runs under Microsoft Windows and two Windows products from Apple subsidiary Claris Corp.: Hollywood, a presentation graphics package; and FileMaker Pro 2.0, based on the successful Macintosh database manager of the same name. Many more Claris Windows applications are promised.

Organizational changes were made in 1991 to better position the company to serve corporate customers. Apple transformed its geography-based sales operation into a market-sector-based one, including a sales and service unit that focuses exclusively on large businesses and institutions.

The marketing move was matched on the product side by the creation of the new Enterprise Systems Division, headed by 18-year IBM R&D manager Morris Taradalsky. And Apple has published its Virtually Integrated Technical Architecture Lifecycle (VITAL)—a huge document that provides a platform-independent framework for constructing distributed multivendor information

systems, based on Apple's own IS operation.

Graziano admits that Apple "must do a better job of integrating Macintoshes with the DOS environment," starting with IBM-Macintosh networking. "A whole suite of products is [already] being developed," he says.

Apple is pursuing consumers as it pursues IS. "As part of the reorganization of the company we set up a division around the personal electronic devices John Sculley has been talking about, to get a clear focus," says Graziano. These will be produced by both Apple and licensees. The first products are promised sometime this year, along with a line of consumer-oriented multimedia computers.

Graziano's bottom line for 1992: "gaining even more market share, with Apple in a leadership position as a technology driver. We can't do that with single-digit market share, and we have set our sights on more than 20%."—Lee Thé



IS Revenue \$3.67 Billion

**ELECTRONIC DATA
SYSTEMS CORP.**

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Dallas, TX 75230
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Hard economic times are not necessarily hard for everyone. For some companies, in fact, they represent an opportunity.

That was certainly true for systems integration and outsourcing leader Electronic Data Systems Corp., which continued to report record revenues, earnings and backlog in 1991 despite—perhaps even because of—economic uncertainty.

"In good times, people have bought from us because...they wanted to

expand. In bad times, people buy from us because they want to watch every penny and make sure they're delivering the best value to the customer," says EDS senior vice president Gary Fernandes.

EDS's revenues, excluding those garnered from its parent company, General Motors Corp., grew a booming 27.7% in 1991 to \$3.67 billion. GM-related revenue was up about 11% to \$3.43 billion, bringing EDS's total revenues in 1991 to \$7.1 billion, up 16% over 1990's level. EDS's net earnings grew 10.2% to \$547.5 million, including an accounting change adjustment.

With the spurt in non-GM activity, more than half of EDS's business came from outside its parent company for the first time since EDS was acquired by GM in 1984.

EDS in 1991 was able to exploit both the continuing trend toward outsourcing among IT users and its own reputation as an experienced outsourcing and facilities management provider.

EDS enjoyed success in its traditional markets such as health care, and it continued to push into newer areas like finance, manufacturing and transportation. Among major deals signed in 1991 were an \$800 million contract to salvage Blue Cross & Blue Shield of Massachusetts's troubled claims-processing system and operate it over a 10-year period; a \$2.1 billion agreement to take over all IT services for Continental Airlines Holdings Inc. and its System One reservation system; a major systems integration project for Signet Banking Corp.; and a 10-year facilities and systems management contract with automotive parts manufacturer PPG Industries Inc.

EDS also made a couple of key acquisitions aimed at increasing the company's global presence, as well as its business from computer-aided design systems. EDS's business has traditionally been heavily dependent on the U.S. market. In fact, in 1991, 80% of its revenues came from the



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United States. In a bid to become more global, EDS in 1991 acquired SD-Scicon U.K. Ltd., a U.K. systems integrator, and its GFI Informatique French systems management and consulting subsidiary. Adding in Scicon's results will increase international revenue from 20% in 1991 to between 25 and 28% of EDS's total this year.

EDS's move into design systems consisted of the company's acquisition of the McDonnell Douglas Systems Integration Co. in November. Along with 2,000 MDSI employees, EDS got the company's key Unigraphics computer-aided design and manufacturing product line. EDS paid an estimated \$250 million to \$300 million for MDSI.

Last year was the year EDS began to participate in another popular IT trend: the move toward client/server computing. The company signed its first major contract to provide desktop-computing services and maintenance. The deal with General Electric Co. is valued at \$500 million over a five-year period.

Fernandes predicts the GE contract is the first of what will be many desktop-oriented deals, as EDS attempts to move from its traditional mainframe technology base. To prepare for that, EDS has been testing the performance of client/server products and modeling the economics of shifting from host-based to client/server platforms.

"People feel it should cost less," says Fernandes. "But the reality is this client/server environment is a very complicated business."

Resolving the complexities of client/server computing for customers may eventually lead to big growth opportunities for EDS, Fernandes believes.

In the meantime, the company's short-term outlook isn't too shabby. Although EDS's GM-related business should be flat in 1992, Fernandes believes non-GM revenues should grow at least by 20% per year for the foreseeable future.—Jeff Moad



SUN MICROSYSTEMS INC.
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 (415)-960-1300

What can you say about a company that increases revenue by 25% and profits by 32% in a recession year?

Closing out its first decade of business in style, workstation and server vendor Sun Microsystems Inc. was a bright spot in a gloomy business climate, with revenues of \$3.45 billion and net earnings of \$199 million. Still, recognizing that no one can afford to sit still, Sun made significant changes to its management structure and kept the new products rolling. Whether these moves will be enough to dampen the headlong rush of competitors remains to be seen, since although revenues increased 25% in 1991, they had increased more, 34%, the previous year.

In July, Sun officially lost its start-up look by reorganizing into five operating companies. They are:

- Sun Microsystems Computer Corp., for workstations and servers based on Sun's Scalable Processor Architecture (SPARC) reduced instruction set computing (RISC) processor;
- SunExpress, for nonsystem SPARC products, such as Intel-based workstations;
- Sun Microsystems Laboratories Inc., for research and development of new products and long-range planning;
- SunSoft Inc., which offers UNIX software for SPARC and other volume platforms;
- Sun Technology Enterprises Inc., for value-added software and hardware.

The company refuses to disclose profits or losses by group, but it does say SunSoft and Sun Technology should each contribute \$100 million and SunExpress \$170 million in revenues in their first year.

Although the vast majority of sales still are from hardware, Sun clearly is positioning itself for a relatively more software-oriented future. "We want prejudiced advocates for technologies that would have been subsumed and lost within the Sun Microsystems of a year ago," says Thomas Meredith, vice president and treasurer.

Although analysts say that software won't contribute much to earnings until 1993, the evidence is here already that software is taking on a new commercial, and more PC-based, look at Sun. In September, SunSoft unveiled the UNIX-based Solaris, which it dubbed the "first shrink-wrapped distributed-computing environment." Solaris 1.0 was available immediately for SPARC systems, but version 2.0, which will run on both SPARC and Intel X86-based systems, represents the first move into the non-SPARC arena. Both 2.0 versions are due to be generally available in mid-1992. To further underscore its new commitment to the Intel platform, in January 1992 Sun completed its acquisition of Interactive Systems Corp.'s Intel-based UNIX business.

To better understand Sun's strategy one need only look at the hardware market. Sun's bread and butter continues to be workstations, but it's facing heavy competition from Digital Equipment Corp., Hewlett-Packard Co. and IBM, all of which produce chips that are similar to or surpass Sun's SPARC line in performance. One of the most striking signs that Sun no longer owns the workstation market was Computervision's decision in early 1992 to end its Sun-only policy and incorporate HP hardware into its systems as well.

Sun received a sales boost in September when it announced its high-end SPARCserver 600MP series. In the last quarter of 1991, it sold 2,600 600MP units, a number Meredith terms "extremely heartening."

Servers make up less than 10% of all units sold by Sun (approximately 200,000 total hardware units were



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shipped in 1991), but their high price tags make them important to the revenue stream. On the workstation side, Sun announced in July the SPARCstation IPX, a midrange color desktop system, and the entry-level SPARCstation ELC.

In the meanwhile, Sun continues to be one of the leanest and meanest companies in the business. With approximately 12,400 employees, it generates an impressive \$278,600 per employee. The call for the future is to generate \$10 billion in sales with 15,000 workers, which would work out to \$666,666 per person. While it's doubtful Sun can achieve that goal, the company has proved remarkably adept at rewriting the way an industry does business.

—Susan Kerr



For nine years, champagne corks were popped whenever sales figures were released. But the champagne remained on ice at Compaq Computer Corp. last year. In the third quarter, sales took a dive, along with profits. The end result? The first major change in leadership since the company was founded in 1982. The founder himself, in fact, president and chief executive officer Joseph R. (Rod) Canion, was sent packing by the board of directors, replaced by Eckhard Pfeiffer, who had been chief operating officer.

That third-quarter \$70.3 million loss was caused by the PC firm's first layoffs, as the company cut 1,400 employees and took a \$135 million charge in the process. In all, Compaq took in 9% less in 1991 than it did in 1990, as revenues slipped to \$3.27 billion. Net earnings plummeted 71%, dropping from

\$455 million in 1990 to only \$131 million last year.

The steady diet of bad news was followed by some slices of humble pie, as Compaq executives were forced to admit that smaller, more agile PC manufacturers had, in effect, done to Compaq what Compaq had done to IBM. "What was a strategy that was successful in the 1980s is simply not a successful strategy in the 1990s," says Kevin Boren, vice president of marketing for Compaq's systems division.

So Pfeiffer began streamlining operations and rethinking many of Compaq's entrenched ideas. And few ideas were more entrenched than the company's dogged dependence on its dealers as its sole distribution channel. Pfeiffer signed up Merisel Corp. and Tech Data Corp. to sell Compaq products to specialized resellers. Andersen Consulting and Electronic Data Systems Corp. have also been authorized to sell Compaq products as part of their systems integration deals. At the low end of the market, Compaq authorized Tandy Corp. to sell selected Compaq models in their new Computer City Superstores chain.

In conjunction with these changes in its distribution strategy, Compaq opened a customer support center, both for its dealers and customers, in April of 1991. By April of this year, the support center was logging thousands of calls a day, not only for its own hardware but also for network operating systems and selected software products. Further bolstering its support offerings, Compaq signed two third-party service providers, General Electric Co.'s computer service division and TRW Inc.'s customer service group, to handle on-site service.

The company's products also got a face-lift last year. Just before his ouster, Canion oversaw the release of a new line of modular PCs, the DeskPRO/M line, and a new "Lite" version of the company's SystemPRO line of servers. Both have been well received by customers, analysts say. The company also introduced a color portable 486 PC aimed at a niche mar-

ket, orders for which have exceeded expectations, company officials report.

Compaq cut prices on all of its products during 1991, as the company moved closer to head-to-head competition with the likes of AST Research Inc. and Dell Computer Corp. To enable it to cut those costs—and still show a good return on sales—the company is systematically overhauling its design and manufacturing operations to allow greater flexibility in pricing. For example, its new line of DeskPRO/M modular PCs and its new SystemPRO machines share common parts.

Internationally, Compaq continued to rack up good sales, as overseas dollars accounted for 59% of the company's revenue. During 1991, the company expanded its presence in Japan and Latin America. But Compaq is now facing its chief competitor overseas as well; Dell has established a strong beachhead in Europe.

Early this year, Compaq ended its investment in Silicon Graphics Inc., and with it, plans for the two firms to share graphics technology. Compaq itself continues to be at the center of rumors regarding acquisition by another high-tech firm. The rumors are continually denied by Compaq officials, but it's doubtful they'll stop until the champagne starts flowing again.

—Bob Francis



Although Xerox Corp. introduced several innovative products in 1991, including a color printer to jumpstart the young color-printing market, the new wares didn't help Xerox avoid less-than-vibrant financial performance.

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Executive vice president of operations Wayland R. Hicks admits resignedly that the company's essentially flat performance last year was only "OK." DATAMATION estimates that Xerox's IT revenues improved nearly 5% to \$2.93 billion, but total revenues declined a slight 0.8% to \$17.8 billion. And while net earnings dropped 8.6% to \$454 million, that caused far less pain than Xerox felt the previous year, when earnings plummeted 65% due to extraordinary charges.

Company officials blame Xerox's pedestrian performance on lackluster sales of its larger copiers and printers, which they say slowed as a result of the poor economy. Poor economy or no, however, having had its fill of flat earnings, management shook up the company this year. Chief executive officer Paul Allaire in March 1992 broke Xerox's document-processing business into nine product and service divisions, most of which have what the company calls "end-to-end" responsibility for manufacturing through sales.

The reorganization is an effort to rev "the clock speed of the organization," says Hicks. Of the previous structure, he says, "decisions had to rise higher in the organization than you would like, to get resolution. The higher you have to go, the longer it takes to get resolved.... We had turf issues." The result? "All this caused us to do things slower than we would have liked to," he says.

Not only is the reorganization designed to help the company speed products to market, it's also intended to help Xerox reduce its high administrative costs by increasing efficiency. Last year, the company took a \$175 million charge to pay for costs associated with reducing its work force by 2,500 people, a process that Hicks expects to be complete by year's end. Work-force reductions are nothing new to Xerox, which has shrunk its employee pool by 20,000 people since 1980 to the 100,000 where it now stands. Hicks predicts that although production volumes will grow throughout the decade, the work force won't.

Although Xerox faced numerous challenges last year, all of the news from Stamford was certainly not bleak. Boston-based Cowen & Co. managing director Steve Weber reports that more than 60% of Xerox's revenue is recurring, coming from maintenance, supplies, finance and rental income. On the product side, in September, Xerox introduced five new printers, ranging in speeds from 11 to 135 pages per minute. Analysts lauded each of them for technical innovation. Such a diversity of printers is a bit of a departure for Xerox. The company dominates the market for mainframe-class printers, but in the desktop and network printer market, has landed few punches against powerhouse Hewlett-Packard Co.

In other good news, the company's Docutech Production Publisher—a high-volume printer that also includes scanning and copying facilities—met sales expectations, mostly selling as a digital replacement to offset printers. However, Xerox didn't produce a less expensive version of the six-figure machine, which it had originally promised for 1992.

Still, with new products in place, continued expense paring and a determination to lead in the hot-growth market for color printing and copying, analysts forecast a turnaround. For Xerox, the future should get a whole lot brighter.—*Elaine L. Appleton*

Revenues for the calendar year held steady at \$2.67 billion, maintaining Seagate's position as the largest independent storage producer. But idle factories, coupled with steep operating costs led to an expensive \$15.8 million restructuring charge. That contributed mightily to turning 1990's \$99.7 million profit into a 1991 \$11 million net loss, which sent company heads spinning.

Among the casualties was president and chief operating officer Tom Mitchell, the premier proponent of the volume-marketing approach. After Mitchell's departure in September, chief executive officer and founder Alan Shugart reasserted his role in managing the organization, refocusing the company from volume commodity products to those that can justify a higher profit margin.

"Instead of trying to architect products that justify high-volume production, Shugart will try to target new drives at a specific customer base, bring them to market quickly and price them to ensure that Seagate sees a return," says Alexa McCloughan, vice president of storage research at International Data Corp. Margins matter more than volume in tight markets, she says.

She and other Seagate watchers in the industry think the company is now back on track. Shugart's new strategy paid off for the first time late last year with the introduction of the Seagate 1480, a 425-megabyte, 3.5-inch drive targeted at the workstation and minicomputer markets. Although competitors Conner Peripherals Inc. and Quantum Corp. promised similar products with higher capacities, industry demand was ripe, and Seagate got there first. According to McCloughan, Seagate is outselling Conner, its closest competitor in this niche, by more than two to one.

For many, the Seagate name remains synonymous with PC disk drives, and Shugart claims a revival of the desktop PC market helped



IS Revenue \$2.67 Billion

SEAGATE TECHNOLOGY
920 Disc Drive
Scotts Valley, CA 95067
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Excess manufacturing capacity caught up with storage vendor Seagate Technology, as the company's long-held high-volume production strategy ran out of steam in 1991.



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turn the company's fortunes around in the final quarter of 1991. David Zalante, vice president of systems research at IDC, agrees. "Affordable high-end PCs helped Seagate navigate some choppy water," he says.

Still, as storage prices plummet and higher areal densities gobble research and development dollars, increasing demand for desktop storage hasn't taken any of the heat off Seagate. The company's 2.5-inch drives for laptops and notebook computers demonstrated little sales get up and go, as well-timed offerings from Conner Peripherals and Quantum dominated last year's boomlet in portable computing. By the time Seagate arrived on the low-end notebook scene, the mobile computer market had decided to sit down and take a rest.

Nonetheless, Zalante thinks Seagate is poised to regain lost ground in 1992. "Few storage companies can claim Seagate's technology resources—the manufacturing capacity, the chemists and the physicists who really understand head and media technologies," says Zalante. "And Seagate is just beginning to leverage some of the controller technologies it gained from the purchase of Imprimis [Technology Inc.] two years ago," he adds.

Shugart believes better management of Seagate's resources is his key challenge for 1992. "This is a tough, cyclical business; ups and downs are hard to predict," he says. "You've got to know when to reduce capacity and when to take reserves." The constant threat of competition from Japanese giants, like Fujitsu Ltd. and Toshiba Corp. (not to mention U.S. heavyweights like Hewlett-Packard Co. and IBM), which can allocate manufacturing capacity at a moment's notice, makes scaling back Seagate's own infrastructure a risky proposition.

—Don Marks



IS Revenue \$2.28 Billion

NORTH AMERICA

MICROSOFT CORP.
Microsoft Way
Redmond, WA 98052
(206)-882-8080

The success of Windows created a major new application software category, and Microsoft Corp. was ready in 1991 to take advantage of it.

The results were impressive: revenue up an expansive 53.8% to \$2.28 billion and net earnings soaring 63.5% to \$581.4 million.

Major 1991 introductions included MS-DOS 5 and Visual Basic, followed this spring by Microsoft C/C++ 7.0, its first object-oriented language. The forte of both languages lies in developing applications for the Windows graphical user interface. And DOS 5, which can run with Windows, aids memory management.

By year's end, Microsoft sold more than 9 million copies of Windows—and that was without the help of the still-under-development Windows 3.1 and Windows NT. Windows 3.1 rolled out in April 1992 to critical acclaim—and in seven languages at once, in deference to the 56% of Microsoft revenues that come from abroad.

For the new release of Windows, says chairman and chief executive officer William H. Gates, "more than 50% of Windows's code was changed; installation, usability, and speed are all worlds apart [from Windows 3.0]." He goes on to promise the 32-bit fault tolerant Windows NT by December—probably.

Microsoft's applications division accounted for the majority of total revenue—51% for fiscal 1991, 3% more than it had the previous year. That gain came at the expense of the system software and language division. The applications division's success rests more and more on its suite of Windows products, which numbered a dozen at year end. The Excel spread-

sheet was updated last winter and this spring. Perhaps even more important was a major revision to Word For Windows last October, which was received with general critical acclaim.

Gates has said the company's first database product, code-named Cirrus, should ship by the end of this year. Meanwhile, Microsoft is in the process of acquiring Fox Software Inc.—both its programming team and its Foxbase line of dBase-compatible database products. This should let it lock horns with Borland International Inc.'s coming dBase and Paradox For Windows products.

In the midst of all this activity, Gates took the time to revise Microsoft's top management structure this February, eliminating president Michael R. Hallman's position in favor of a team of top executives from the main divisions. "We went from having two people work for me to having five people work for me," says Gates. "There are now four levels of management from me to the developers," adds Gates, "or none—with e-mail."

—Lee Thé



IS Revenue \$2.26 Billion

NORTH AMERICA

ANDERSEN CONSULTING
69 West Washington Street
Chicago, IL 60602
(312)-580-0069

Andersen Consulting has been helping Fortune 1,000 firms set up new computer systems since 1954, when the firm installed the world's first commercial computer application for the General Electric Co. Since then, of course, commercial computing has been through a few changes. And Andersen has been changing right along with it.

In 1989, for example, the consulting group's parent, the accounting firm of Arthur Andersen & Co., spun off the consulting operation into an independent business.



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The spin-off seems to have paid off; Andersen Consulting's revenue surged in 1990, from an estimated \$1.22 billion when it was part of the accounting group in 1989, to a revised \$1.88 billion. That adds up to an astounding 54.1% growth. Andersen's 25,000 employees at its 145 worldwide offices were even busier last year, when revenue grew by another 20.2% to \$2.26 billion, squarely within managing partner George T. Shaheen's expectations of 15 to 30% revenue growth for last year.

This year, says Shaheen, Andersen is changing its strategy to help customers manage what the firm sees as a sea change under way in commercial computing. "We grew up in this business as systems builders. We've carved out a role for ourselves as the premier systems integrator in the commercial marketplace. But this year we'll be reaching for a higher plane. This year, we will be offering more than just systems integration services—we will be providing business integration services."

Shaheen defines business integration, in contrast to systems integration, as implementing information technology in all areas of business management, including strategic, operational and financial sectors.

"We're combining technologies, strategies and organizations with changes in business process at our clients, many of whom are literally reinventing themselves as business operations," says Shaheen.

And the instrument for business integration at a growing number of Andersen's clients is client/server technology. About half of Andersen's customers today are developing new client/server implementations, says Shaheen, and about 70% of the new business coming in is for client/server systems.

Andersen's new client/server development products available as part of its Foundation computer-aided software engineering (CASE) tool system may be one explanation for the increase in client/server business.

Sales of the Foundation product line increased a heady 70% in 1991 to \$100 million.

The company plans to ship Foundation For Cooperative Processing for UNIX platforms this year.

Not to be outdone by its own clients, Andersen is itself considering ways to reinvent itself in 1992. Shaheen points to Project Eagle, an internal project to transform its current product line and determine what entirely new products to develop and enhance over the next few years.—*J. William Semich*



Ninety-year-old TRW Inc. showed many signs of strain in 1991. Sales were down, losses mounted up and the company seemed buckled under by the weight of too many noncomplementary businesses. So TRW executives decided that 1991 was the time to shape up and ship out those businesses that were dragging it down.

All three segments of TRW will be streamlined, including its Automotive Group and its Space & Defense Group. But the heaviest hand will fall upon the company's IS businesses. In December, TRW announced that, within the Information Systems & Services Group, it would divest itself of its real estate loan document-processing services, receivables management and computer maintenance units. The new core of TRW's IS&S group will now be consumer and business credit reporting, target marketing, real estate information and financial systems. (For ranking purposes, the DATAMATION 100 does not include credit-based revenue.)

In all, TRW incurred a \$365 million charge in the fourth quarter of 1991 for restructuring; almost half, \$181 million, was attributable to write-downs in information systems. That left the company with a year-end loss of \$140 million on total corporate revenue of \$7.9 billion compared with a profit of \$208 million and revenue of \$8.2 billion the previous year.

The IS&S group posted 5.0% revenue growth in 1991 to \$1.95 billion. But it suffered a \$138 million loss, whereas in 1990 it had earned a \$49 million profit. Through attrition and layoffs, information systems-related employment at TRW dropped 10% to 14,695 workers last year. For 1992, the IS&S group is looking to reduce costs by \$50 million.

Real estate loan services were a bright spot for the group. While the company will no longer handle loan document processing, it plans to keep and manage real estate data files. In the third quarter, TRW and Elsevier Realty Information Inc. formed a joint venture, TRW REDI Property Data, to provide real estate information services to 40,000 customers. That venture added about \$10 million a quarter in sales. In other good news, the Financial Systems unit won a \$25 million contract to build a multisite imaging system for the NMB Postbank Group of The Netherlands.

The best news for the company would be if it could sell its computer maintenance group, which has been on and off the selling block for more than a year. "We've been handicapped with the drag of the computer maintenance business," says Joseph T. Gorman, TRW's chairman and chief executive officer. TRW thought it had a buyer in 1991, but financing fell through. Company executives have given themselves 18 months to complete the corporate divestment project. If no takers are found by mid-1993 for all the businesses up for sale, executives will reevaluate the strategy and decide whether simply to close down the operations entirely.



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On the corporate side, Edsel D. Dunford was promoted to president and chief operating officer. The 27-year TRW veteran had previously been executive vice president and general manager of the Space & Defense Group.—*Susan Kerr*

IS Revenue **15** \$1.94 Billion
NORTH AMERICA

COMPUTER SCIENCES CORP.
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El Segundo, CA 90245
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Computer Sciences Corp. tried valiantly in 1991 to broaden its systems integration business from its base in the government market to encompass more of the commercial sector. And the company pulled in nearly \$4.7 billion in new business from both government and commercial customers last year. Many of the contracts are multiple-year orders, running as long as five, 10 and 12 years. That's the good news.

The bad news is that some of the new business, especially a \$3 billion, 10-year order from General Dynamics Corp. to manage its aerospace and defense data centers, may be diluted by Defense Department cutbacks.

And early this spring, the company was smarting from allegations in connection with a \$347 million five-year contract it had won in 1990 from the Environmental Protection Agency.

As part of an internal investigation of its own accounting practices, which may have left too much of the oversight for its contracts to the contractors themselves, the EPA alleged "serious deficiencies in accounting procedures" of CSC in relation to EPA contracts.

The publicity was widespread and damaging, and not only to Computer Sciences. The EPA incident was followed by a 10% drop in CSC stock,

which had peaked at 84 at the end of February.

Analysts, meanwhile, caution that CSC could also be hurt by a proposed cutback in the Navy's Seawolf submarine program. CSC is designing the software for the submarine's advanced combat system. In addition, its contract with General Dynamics includes the management of the Norwich, Conn., data center that supports that company's Electric Boat division in Groton, Conn., the Seawolf contractor.

Through it all, CSC's revenue kept growing, rising another 15.8% to \$1.94 billion, keeping pace with the previous year's revenue growth. But earnings dropped 3.7% to \$65.5 million in 1991 after having risen 16% in the previous year, partly because of losses incurred in Europe.

In a move to strengthen its European operations, the company acquired Butler Cox PLC, an \$18 million London-based management consulting firm. It will be absorbed into Computer Sciences's consulting arm CSC Index Inc. in its European operations in Belgium, Germany, the Netherlands and the United Kingdom. CSC also acquired Moria Informatique, a systems integration and software firm based in Paris.

William R. Hoover, CSC's chairman and president, said the acquisitions represent a commitment "to build a truly global management consulting firm with strong depth in information technology." He attributed last year's European losses to a "recessionary climate" in Europe.

Computer Sciences moved to strengthen its U.S. computer consulting activities through the acquisition last year of Analytics Inc., CompuSource, Intelicom Solutions Corp. and Paragon Consulting Group (now Cleveland Consulting Associates).

At the end of the year, Alvin E. Nashman retired as head of CSC Systems Group. The Falls Church, Va., group has some 14,500 employees. Nashman will remain a member of the CSC board, a post he's held 24 years.

The company early this year named James R. Mellor, president and chief executive officer of General Dynamics Corp., to its board, bringing total membership to nine.—*Tom McCusker*

IS Revenue **16** \$1.94 Billion
NORTH AMERICA

WANG LABORATORIES INC.
1 Industrial Avenue
Lowell, MA 01851
(508)-459-5000

What do you do when your company's core business gives way to new technologies and stronger competition?

Manage in innovative ways.

In word and deed, that's what chairman Richard W. Miller and his band of managers are doing at 41-year-old Wang Laboratories Inc. As in the case of its Massachusetts neighbors Data General Corp., Digital Equipment Corp. and Prime Computer Inc., Wang's technological stronghold of minicomputers is under siege by networked personal computers and workstations.

The battle, under way for some time, took its toll on Wang again in 1991. It lost \$380 million on \$1.94 billion in revenues. That's much less severe, however, than the \$665 million in red ink that spilled across the company the previous year when sales totaled almost \$2.4 billion.

Consider how exactly Miller & Co. responded under fire in 1991:

■ Wang in essence became a value-added reseller for several products made by its biggest competitor, IBM, integrating, in some cases, Big Blue's products with its own brands.

■ Wang backed away from some customer segments, such as manufacturing applications.

■ Wang launched a clever attack on the biggest problem facing corporate computing users—lack of white-collar

NORTH AMERICAN COMPANIES



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productivity gains.

■ Wang started selling personal computers in department stores and other mass merchandise channels.

"There is not another company in the computer industry that is modeled the way we are," says Miller. "Boeing is the best model I can point to. It doesn't make engines, but it is an excellent integrator of them. And Boeing provides world-class service."

Whether Miller's systems integration plans for Wang fly with customers remains to be determined. Only now are they beginning to see bona fide products appear from the Office 2000 blueprint Miller unveiled a year ago—office automation software and services that add value to the IBM RS/6000 midrange and IBM PS/2 desktop systems that Wang resells and to the VS midrange systems and Exec personal computers that it makes and markets.

When U.S. customers of Wang were surveyed by DATAMATION and Cowen & Co. earlier this year, before Wang executives embarked on a worldwide 11-city tour to brief IS managers on the company's office vision, these customers were decidedly down on the supplier. Only one out of four Wang customers who now use its products as their primary departmental systems intended to stay with Wang in the future, according to the survey. The United States accounts for 40% of Wang's business.

Despite this customer dissension, departmental applications remain Wang's primary focus. It's trying to sell professional, administrative and support systems for departments in financial services firms, insurance carriers, government agencies, health-care providers and legal firms. "Our success does not lie at the enterprise, backbone networking level, where we had been trying to compete," says David I. Goulden, vice president of Office 2000 Systems Marketing.

As part of the agreement with IBM, Wang's strategy is to help customers move off Wang's VS systems

onto IBM's AS/400 machines. Why? The company doesn't want to lose the revenue stream from or the goodwill of customers whose applications—process control and retailing, for example—no longer fit Wang's core strategy of developing software and systems for the office. "We have the technologies and services to help them with the conversion [from VS to AS/400]," says Joseph M. Tucci, executive vice president of Wang.

The Wang and IBM alliance, announced a year ago, is paying off for Wang in a number of other ways. Besides giving Wang \$25 million (a loan that Big Blue can convert into Wang stock at a later date), IBM lends stability to the company. "Sales of our VS systems have gone up since we made the IBM announcement because it gives our customers a safety valve," Tucci claims.

Wang's own research and development investments, which annually total more than \$200 million—more than 10% of revenues—are split evenly between software for the RS/6000 platform and both software and hardware for the VS line of midrange systems and servers. Customers eager to see evidence of Wang's promise to continue enhancing the VS—still the company's chief revenue generator by far—by now should be deluged with technical documentation on three-dozen VS-related product introductions scheduled for this spring and summer. Notable among them is Mercury, the code name for Wang's VS 12000 high-end processor. Based on bipolar chip technology supplied by Hitachi Ltd., Mercury boasts 50% greater performance than its predecessor, the VS 10000.

Whether those products, Exec PCs sold through mass market retailers like Service Merchandise Co. Inc. and the IBM systems remarketed by Wang are enough to return the company to profitability in 1992 may rest more on global economic conditions than on any other single factor. "Europe is a bloodbath," Miller said in late January, addressing a region of

the world that traditionally provides about a third of Wang's sales. "Economically, it's where the United States was nine months ago." Asia, however, remains a dynamic market for the company—generating upwards of 15% of Wang's revenues.

—Tim Mead

IS Revenue
\$1.93 Billion

TANDEM COMPUTERS INC.

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Cupertino, CA 95014
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It's been pretty obvious for some time now that Tandem Computers Inc. is no longer the high-flying quintessential growth company that it was in the late 1970s and most of the 1980s. By the end of 1991, management was forced by slowing revenues and abundant red ink to start sketching a new business model for Tandem as a more efficient, slower-growing vendor of highly reliable, on-line transaction-processing systems.

"Our management team's model was always oriented toward being able to sell and being customer oriented in good times," says Tandem president and chief executive officer James G. Treybig. "But the '90s aren't going to be good times. So we have to change that model and change how we think and act. We want to stay oriented toward customers, for sure. But we have to start being oriented toward processes that lead to productivity."

Helping Treybig and his team discover their new focus on efficiency and productivity was a \$66.5 million 1991 loss that included a \$98.1 million corporate-restructuring charge. Tandem's revenues for the year grew only 3.2% to \$1.93 billion. That rate of growth was less than a third of what Tandem saw just a year earlier and a far cry from the company's

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50%-plus go-go years.

The worldwide recession has certainly been a factor in Tandem's slowdown. But Treybig sees more fundamental reasons, as well. Customers are confused by the move to open systems and client/server computing. And, in tougher economic times, says Treybig, they're inclined to question the size of the bottom-line returns they've received from their massive investments in information technology. As a result, says Treybig, "I think we're, in some countries, in a period of reevaluation." Tandem's business has slowed in Japan and the United Kingdom, in particular.

Tandem is doing some reevaluation of its own. A first step came at the end of 1991 when Tandem announced restructuring plans expected to generate savings of up to \$50 million in 1992 and up to \$100 million in 1993. Those plans include a 9% reduction in staff by September 1992.

Tandem is also looking to become more efficient by improving certain key business processes such as marketing and software development. Tandem is focusing its marketing efforts on application areas like intelligent networking and payment systems that still have the potential for rapid growth.

Tandem invested directly in one such vertical application area in 1991 when it acquired from US West Inc. its Applied Communications Inc. subsidiary, which specializes in integrated banking systems. Another key market for Tandem has been telecommunications, where its Tandem Telecommunications Systems Inc. subsidiary helped increase the company's telecom revenues to 36% of the company's total in the fourth quarter. That compared with 25% for the previous year.

Tandem has also targeted companies engaged in bulk transaction processing, such as credit card and airline reservation processors. Forty percent of Tandem's business already comes from customers like

Visa USA Inc., and Tandem hopes to increase that by offering those customers cheaper transactions through lower cost hardware. To that end, Tandem in 1991 replaced the midrange portion of its Cyclone and CLX product lines with fault-tolerant hardware based on reduced instruction set computing chips from Mips Computer Systems Inc. Price/performance for the new products, dubbed CLX/R and Cyclone/R, are as much as twice as great as for previous Cyclone and CLX products based on proprietary processors.

The new RISC-based products did not start shipping until late 1991 and early 1992. But already, Tandem says, initial orders are strong, and in the first quarter of this year, Tandem returned to profitability, reporting earnings of \$8.8 million.

—Jeff Moad

IS Revenue \$1.81 Billion

NORTH AMERICA

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AUTOMATIC DATA PROCESSING INC.

One ADP Boulevard
Roseland, NJ 07068
(201)-994-5000

The world's largest computer services company slogged through the recession last year, posting meager 4% growth in revenue to \$1.81 billion and a modest 8.7% rise in net earnings to \$239 million.

During the year, ADP's strategy for broadening product sets in its four core business segments took a back seat to recession-related priorities. "The greatest thing we're doing is managing to control costs, improve margins and improve products, and waiting for the economy to improve," says Arthur F. Weinbach, senior vice president for administration and finance. Three other factors affecting financial performance in 1991 were the continuation of a stock-repur-

chasing program (12 million shares since 1990); lower yields on investments, in particular, interest income; and continued pruning of noncore businesses, including certain batch-accounting services, network services and certain commodity quotation services.

Within ADP's core businesses, Employer Services—the traditional payroll-processing operation that at 58% of the company is ADP's oldest and largest business—grew in the 11 to 12% range in 1991. That was slower than ADP had anticipated. Layoffs at its customers' shops in the U.S. service industry cost ADP about 1% in revenue growth last year.

In Brokerage Services, which has been struggling to achieve growth for the last couple of years, ADP focused on bringing its cost structure down. As it did so, transaction volumes rose at its Wall Street customers in the second half of the year, driving revenue enough for brokerage services to break even.

Two new customers brought into the fold for the front-office services sector of the brokerage division in 1991 were The First Boston Corp. and Smith Barney, Harris Upham & Co. Inc. In a contract that will run six and a half years, Smith Barney plans to install more than 4,200 ADP FS Partner workstations, which are based on IBM PS/2 computers. First Boston ordered 600 FS Partner systems for its Equity Trading and Investment Banking departments.

Dealer Services, representing about 11% of ADP, chalked up 5 to 6% revenue growth last year, which chairman Weston believes was a fairly good performance given the considerable failure rate among automobile dealers in the last few years.

In February of this year, ADP signed a \$50 million contract to resell Motorola's Delta series 8000 multiuser systems, which are based on the 88000 RISC chip. In other Dealer product lines, ADP had by December installed 2,000



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of its previously introduced HP-built LaserStations in car dealerships and had a 500-unit backlog going into 1992.

Automotive Claims, representing about 5% of ADP, enjoyed double-digit revenue growth. The company announced a joint venture with San Diego-based Mitchell International to develop a repair-estimating service for body shops. The goal of the venture is to get body shops to electronically standardize the way they prepare estimates to reduce disparities with those from insurance companies. ADP is also jointly developing with IBM and State Farm Mutual Automobile Insurance Co. what Weston described as a "tablet form" handheld device, equipped with the "equivalent of a zoom lens," that would enable insurance adjusters to input and process claims information.

On the acquisition front, ADP bought National Auto Data Service of Milwaukie, Ore., which provides vehicle replacement estimates primarily in the Northwest. Automotive Claims also signed renewal contracts with State Farm and Allstate Insurance Co., its two biggest customers.

Another development that potentially has longer term strategic consequences was the acquisition in January 1992 of Autonom, a Dusseldorf, Germany-based auto dealer services company with 1,000 clients and \$20 million in revenue. This was the first non-U.S. acquisition ADP has made in several years, representing a change in strategy under Weston.

"I do not think that there's a priority for expansion in Germany," says Weinbach. "North America is still a greater return on management time. But international customers are looking for common technology and platforms. We could look for small acquisitions and inroads to lay a foundation for what may be an expansion opportunity in Europe in the latter half of the '90s. Directionally, the thinking is there."

—David R. Brousell



IS Revenue **\$1.70 Billion**

AMDAHL CORP.
1250 East Arques Avenue
Sunnyvale, CA 94088
(408)-746-6000

Searching for something positive to say about 1991, Amdahl Corp. chief financial officer Ed Thompson recently concluded, "It will be a great year to make comparisons against."

It certainly will be, assuming the plug-compatible mainframe vendor's business improves in 1992.

Amdahl, for the first time since it was founded in 1970, reported a net operating loss in a quarter, dropping \$18.9 million in the final period of 1991. The loss, brought on by a combination of recession, sustained discounting in the mainframe market and Amdahl's own production problems, was accompanied by a 39.5% fourth-quarter revenue skid. The weak year-end result reduced Amdahl's net earnings by 97.6% to \$4.4 million before an extraordinary tax credit of \$6.2 million. Revenue for the year, at \$1.70 billion, was down 21% from 1990's level.

Although Amdahl managed to ship about as many processors in North America in 1991 as it did in 1990, the company suffered from a weak European market and rampant discounting of mainframe prices worldwide. The discounts, which came as Amdahl and competitors Hitachi Data Systems Corp. and IBM engineered a transition to a new generation of mainframe products, helped reduce Amdahl's gross profit margin by 30.5% in 1991 to just 37.5%.

"Nineteen ninety one was a much more difficult year than we anticipated," understates president E. Joseph Zemke.

Amdahl did manage to meet its deadline for beginning production shipments of its new 5995M mainframe systems by year-end 1991. Analysts estimate that Amdahl actually shipped

three of the 5995M three- and four-processor mainframe systems last year. The company expects to ship at least 150 of them by the end of 1992, Zemke says.

Amdahl's production problems carried over into 1992, however, when the company announced it would be unable to meet its second-quarter deadline for shipping the top-of-the-line six- and eight-processor versions of the new 5995Ms. Amdahl said testing problems related to a new automated console feature would delay initial shipments until the third quarter of this year.

Zemke says the delay won't affect Amdahl's 1992 revenue and earnings. The company will instead be able to ship more smaller systems early in the year, he explains. Early in 1992, Zemke predicted Amdahl would return to profitability in the first quarter of 1992, and he reported a record order backlog for 5995M systems entering 1992.

And in fact, Amdahl reported first-quarter 1992 revenues of \$497.9 million, 12.5% higher than they were in the first quarter of 1991. Net earnings, although 61.6% off, were indeed in the black, at \$4.39 million. Amdahl said production shipments of its new 5995M mainframes and 6390 disk drives helped revenues, although high manufacturing and testing costs associated with the new production hurt earnings.

The delay in shipping its high-end products, however, will make it harder for Amdahl to escape the competitive pricing pressure it's been facing. Bob Djurdjevic, president of Phoenix-based Annex Research, expects IBM to begin shipping its own eight-processor ES/9000 mainframe by the end of this year. "That will begin a whole new cycle of discounting at the high end," he predicts.

In the end, the best way for Amdahl to escape from the pricing pressures of the mainframe hardware business will be to exploit new software and service markets. That's exactly what the company began to do in 1991, introducing a significant new release of its UTS



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UNIX-derived operating system, as well as a major new application development environment, dubbed Huron. Amdahl hopes to use those products to sell its commercial mainframe customers on moving to open systems software.

That will take time, however. Zemke says the \$200 million in open systems revenues Amdahl pulled in in 1991 fell short of expectations. And, through the end of 1991, Amdahl had shipped Huron to only 20 customers, falling about a quarter behind its shipment target. While Amdahl is optimistic about both UTS and Huron for 1992, Zemke admits "it's too early to call either a success."—*Jeff Moad*



CONNER PERIPHERALS INC.
3081 Zanker Road
San Jose, CA 95134
(408)-456-4500

You'd hardly know that the recession finally caught up with Conner Peripherals Inc. last year. Its 1991 revenues reached \$1.60 billion, a 19.6% increase over the year before. Of the six major independent disk drive manufacturers, it did the best in terms of profitability, according to Moody's Investors Service Inc. And with a \$600 million cash hoard, it ended the year in the strongest financial position in its five-year history, according to Finis Conner, its chairman and chief executive officer.

While its revenues set another record, its earnings dropped for the first time, by 29% to \$92.5 million—due, says Conner, to the "effects of worldwide recession." Nevertheless, the company remains a formidable player in the 3.5- and 2.5-inch disk drive business, holding a 90% market share in the 2.5-inch field, Moody's says.

Analysts attribute the company's remarkable performance to fast foot-

work, which is essential in the rapidly changing PC market. For example, while 2.5-inch disk drives contributed to Conner's strong performance for three quarters of last year, it led to a poor fourth quarter when the supply of notebook computers saturated the market much faster than anticipated.

To cope with change, Conner has moved fast. As the recession began to affect performance last year, it spun off its thin-film headstack operations in Malaysia to Read-Rite Corp., realizing \$11 million in an exchange of stock. It acquired VISqUS Corp. in another stock swap that gives Conner possession of an advanced head-to-media interface technology. In January, Conner paid \$9 million for a minor equity position in Sunward Technologies Inc., along with ownership of Sunward's patent for a new form of headstack assemblies.

This spring, Conner was issuing a debenture offering that would raise its cash hoard to \$900 million to be used to diversify its business mix.

In May 1991, the company announced five new 2.5- and 3.5-inch hard disk drives, representing the fifth generation of products in Conner's five years. They included an 85-megabyte version of the 2.5-inch drives for Intel 80386- and 80486-based notebook computers. Conner followed this six months later with a 120MB version of the same product. In a product departure, Conner last fall introduced the Chinook, a dual actuator storage system aimed at intensive input/output environments. The dual actuator approach, which can handle up to 140 I/O functions per section, nearly doubles the performance of existing single actuator drives.

Conner does research, development and initial production in the United States and volume production in Asia and Europe. It has plants in Italy, Malaysia, Scotland and Singapore. Last year, it promoted William Watkins, 38, as president of its disk manufacturing division in San Jose.

—*Tom McCusker*



STORAGE TECHNOLOGY CORP.
2270 South 88th Street
Louisville, CO 80028
(303)-673-5151

The poor economy and some determined competition notwithstanding, Storage Technology Corp. continued its steady climb up from its mid-1980s brush with Chapter 11. The midrange/mainframe storage company held firm in its strategy of introducing an aggressive stream of products in a number of markets and reestablishing its distribution channels to set the stage for the vigorous growth its management expects in the mid-1990s.

The 4400 Automated Cartridge System that fueled the bulk of 1990 sales continued to dominate its market in 1991, although not as completely as it had the previous year. StorageTek chief executive officer Ryal R. Poppa admits that other vendors entering the market such as Compax Information Systems GmbH, Memorex Telex Corp., Fujitsu Ltd. and Hitachi Ltd., are eroding StorageTek's market share. And he's concerned about IBM's imminent entry into the market. Still, Poppa claims that his company receives 95 of every 100 dollars spent on cartridge systems.

The value of an overwhelming market share has not been lost on StorageTek management. StorageTek sales came predominantly from the 4400 and related tape cartridge products in 1991, accounting for 57% of revenue. Building on that momentum, the firm announced that it would introduce five products over the next three years to meet the needs of this growing market segment.

In November 1991 StorageTek completed the purchase of midrange systems distributor XL/Datacomp

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and in February 1992 moved to purchase Sweden-based distributor Edata Scandinavia AB. Both moves are intended to help rebuild distribution channels. StorageTek also announced a distribution agreement with Compagnie des Machines Bull and a technology agreement with Matsushita Electric Industrial Co. Ltd. to use a Panasonic helical-scan tape subsystem design for computer data storage. From this agreement, StorageTek expects by 1994 to produce a storage product called Redwood.

StorageTek's purchase of and financial merger with XL/Datacomp creates some confusion when looking at the company's financial performance. Officially, the firm expanded IS revenue for 1991 by a modest 2.6% to \$1.58 billion in 1991. Official earnings look worse, growing by less than 1% to \$93.1 million. These figures, however, combine the financial results of StorageTek with those of troubled XL/Datacomp. Viewed alone, StorageTek actually expanded revenues by about 10%, still shy of last year's 16% gain, and profits are up by more than 20%—impressive, but not near the 45% level enjoyed the previous year.

Still, the brighter picture is more indicative of where StorageTek stands at the moment.

Much of that positive outlook is due to Iceberg, the eagerly awaited disk storage system for mainframe users based on redundant arrays of inexpensive disks (RAID), which was officially announced in January 1992. First customer shipments are scheduled to start next month, and general availability is slated for November. Alpine, a RAID disk array system targeted at midrange systems, is also scheduled to begin shipping in the second half of this year.

As his company poises to begin shipping Iceberg disk arrays, Poppa is far from sanguine about present performance. "My whole focus is on the future," he says. "Starting in the second half of '92, we have a new

product scheduled for every quarter through 1994. The big growth will be in '93 and beyond."—Bill Sharp

NORTHERN TELECOM LTD.
3 Robert Speck Parkway
Mississauga, Ontario, Canada L4Z 3C6
(416)-897-9000

Northern Telecom Ltd. continues to distance itself from the computer business to focus almost exclusively on telecommunications equipment. It completed its acquisition of Britain's telecommunications giant STC PLC for \$2.2 billion in March 1991. Shortly after, however, it was negotiating with unnamed companies to sell the 20% interest that STC held in British full-line computer maker ICL PLC. (The remaining stake is owned by Fujitsu Ltd.)

While it had no success as of late spring in divesting itself of ICL, it had immediate success in disposing of three other major assets—STC's electronics distribution, cable products and electrical equipment divisions.

The acquisition of STC, whose name was changed to Northern Telecom Europe Ltd., contributed significantly to the Canadian company's 21% rise in revenues to \$8.18 billion in 1991. In fact, the company says its acquisition of STC made Northern Telecom the second largest designer and manufacturer of telecommunications equipment in North America, behind AT&T, and No. 3 in the world. DATAMATION estimates a 19.7% rise in IS revenues to \$1.46 billion.

Nevertheless, the largest increase was in international sales, while U.S. and Canadian revenue advances were lower, due to the recession.

Dr. Paul G. Stern, chairman, president and chief executive officer, says,

another key to the company's growth was "the continued network modernization in many overseas countries." That modernization is reflected in healthy spending on research and development, which increased to \$1.23 billion, or fully 15% of total revenue in 1991. It's also reflected in Northern Telecom's net earnings, which rose 7.9% to \$496.5 million.

Early this winter, the company completed a 50-50 joint venture with Motorola Inc. into the cellular switching and radio market. It is one, according to John Roth, president of Northern Telecom's Wireless Systems Group, that is expected to generate \$500 million in sales this year and \$1 billion by 1994. He says the venture is aimed at shoring up each company's performance in the \$1.6 billion North American cellular phone market. Analysts estimate Northern Telecom held a 7% share of the market in 1991, and Motorola held an estimated 23% share. AT&T is the leader with 38%, followed by Ericsson with 28%.

During 1991, the company started to make inroads to Eastern European and former Soviet Union telecommunications equipment markets. It has an order to supply \$21 million of central office switching equipment to the republic of Azerbaijan. That will form the backbone of the republic's first digital network. In July, Northern Telecom received an order from the Polish telecommunications company to provide public-switching equipment that will be connected over the next five years to Poland's national telephone system. The order is valued at \$120 million.

This summer, Northern Telecom's vice chairman for products and technology, David G. Vice, 58, will retire to spend more time with family and pursue community interests. Vice, who has been with the company 36 years, was a member of a recently formed four-person Executive Office, and was the company's president for five years.

—Tom McCusker

NORTH AMERICAN COMPANIES

IS Revenue

\$1.44 Billion

NORTH AMERICA

**COMPUTER ASSOCIATES
INTERNATIONAL INC.**1 Computer Associates Plaza
Islandia, NY 11788
(516)-342-5224

No. 2 independent software vendor Computer Associates International Inc. surged out of a two-year period of retrenchment last year with a 9.7% rise in revenue to \$1.44 billion, a new PC and UNIX product strategy and a clear direction for the decade.

Revenue had increased by a barely perceptible 1.6% in 1990 as CA struggled to digest the products, services and massive customer base that accompanied the previous year's purchase of

Cullinet Software Inc. and Applied Data Research. Net earnings also increased respectably last year, up 6.8% to \$173 million.

CA actually set the stage for the 1991 resurgence back in 1990 when the company made two critical strategic decisions. The first was to implement its CA90s strategy to integrate all of its 300-odd software products with each other and across diverse hardware and software platforms. The second was to broaden its product line to include commercial UNIX and PC LAN applications.

Although neither of those two decisions has been completely realized as yet, the company was able to harvest some early fruits last year. Says computer analyst Terence M. Quinn of Kidder, Peabody & Co. Inc. in New York City: "The perception that Computer Associates has few growth

opportunities due to its predominance in the no-growth mainframe computer market is quickly becoming incorrect."

Add's CA chairman, president and chief executive officer Charles Wang: "we recognize that the marketplace has been changing dramatically since the advent of the PC. We've not done well on the PC platform in the past, but we've changed that now—and we've started to show that last year. Our biggest challenge for 1992 is to maintain that momentum."

Evidence from 1991: CA's nonmainframe revenue in the final quarter of 1991 constituted 25% of total revenue for the quarter. The previous year it accounted for less than 10%.

"This was primarily due to particularly strong sales in CA's PC software, primarily dBFast," says Quinn. dBFast is CA's new Windows-based dBase-III compatible database man-

Personal Communications/32

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agement and application development product. CA also launched its first UNIX database management system last year, CA/DB, and is partnering with Hewlett-Packard Co. to develop and market a group of UNIX software applications. The company launched the first of these, its new CA-Unicenter UNIX-based systems management products, early this year.

All that, combined with Wang's decision to take personal control of the company's new Micro Products Division and to boost corporate resources for PC development and marketing, has Quinn predicting that the company's nonmainframe revenue will reach 30 to 35% of total sales by the end of this year.

Of course, Wang still didn't let any good mainframe-based software company acquisitions go by last year. CA acquired On-Line Software International Inc., a vendor of tools and

performance management software for IBM's Customer Information Control System (CICS) and DB2 database management system. It also bought Pansophic Systems Inc., a development tool and AS/400 manufacturing applications vendor, and Access Technology Inc., whose 20/20 product dominates the spreadsheet market on DEC VAX and other vendors' mainframes.

With the Pansophic acquisition, CA also picked up the COBOL compiler and CICS tool vendor Realia, which Pansophic had itself only recently acquired. "Realia is the gem in Pansophic's crown," says Wang, adding that the company has products that include "370 operating system emulation on a PC, CICS for the PC, DL/I and IBM transparency for the PC, VSAM, COBOL—all of it. I'm very excited about that acquisition."

—J. William Semich

IS Revenue

24

\$1.38 Billion

WORLDWIDE

PRIME COMPUTER INC.

100 Crosby Drive
Bedford, MA 01730
(617)-275-1800

Minis are going the way of the dinosaur, and Prime Computer Inc. is trying desperately not to go with them. Instead, it is trying to reinvent itself, and it's slow going. Last year proved just how long it might take.

Total corporate revenue was down 13% to \$1.38 billion, and net earnings dissolved \$16.9 million into the red, a far cry from the \$56.4 million profit recorded in 1990.

Prime is also staring down a well of

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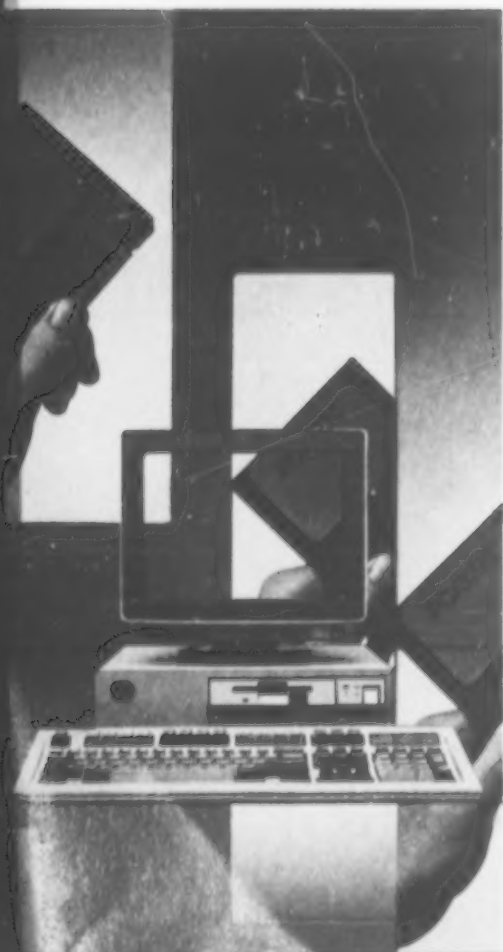
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IBM





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long-term debt that is \$1.24 billion deep, and many are concerned about Prime's ability to repay those loans. In November, Standard & Poor's Corp. lowered its rating to C- on the debt of Prime and DR Holdings Inc., Prime's parent company, and the not-so-white knight that rescued it from a forced takeover.

Nevertheless, the company is moving—away from its proprietary midrange systems and toward service and software.

In fact, it may be difficult to call Prime a minicomputer company anymore. Prime's midrange business only provided about 10%, or \$141.2 million, of its revenues during 1991. Revenues for servers and workstations were more than twice as high, at \$379.2 million. The largest percentage of Prime's revenues, some 41%, came from its maintenance and repair business. Software accounted for \$247.2 million of its revenues, the bulk of it derived from its Computervision Business Unit, which develops and sells computer-aided design and manufacturing (CAD/CAM) software.

These figures reflect an ongoing shift in products for Prime. As part of that strategy, in August 1991 Prime announced that it would phase out its 50 series minicomputers over a five-year period and encourage customers to move over to its UNIX-based EXL systems.

To make itself over, Prime has cut staff, forced others to take unpaid vacations and reorganized. In the spring of last year, Prime announced it would reduce staff by 800, about 11% of its work force. At the end of the summer, Prime merged its manufacturing operation back into its Computer Systems Unit and reorganized its executive ranks. In the fall, Prime announced it would lay off an additional 900 employees. According to Prime, attrition accounted for most of the spring cuts, but layoffs were the order of business in the fall. The Computer Systems and International units were the hardest hit.

Prime might also be trying a new approach. Early this year, it arranged a deal with Hewlett-Packard Co. that seems to echo the deal Wang cut with IBM. The agreement calls for Prime to buy and resell \$400 million worth of HP 9000 systems and Apollo workstations over three and a half years.

—Elizabeth Lindholm



Well, it was nice while it lasted. Data General Corp. returned to profitability in 1991 and stayed there throughout the year, only to announce in quick succession this April a layoff of 1,000 workers (12% of its work force) and a loss of \$55.3 million for the first quarter of 1992.

And it was a great ride. Although DG's revenue dipped 2% to \$1.21 billion for 1991, its profits reached \$77.2 million, a far cry from the \$106.9 million loss posted the year before, not to mention the four preceding years of red ink. Chairman and chief executive officer Ronald L. Skates is generally credited with turning the company around through aggressive cost-cutting measures and a strategy based on the company's AViiON workstations and servers and on the Eclipse MV line of minicomputers.

Over the past two years, Data General has cut its staff in half, to about 8,100. This spring's round of layoffs reduced that number by 12%. Along with the layoffs, Data General consolidated operations and sold its Fountain, Colo., and Clayton, N.C., manufacturing facilities.

As Skates was holding the line on costs, the AViiON line of computers

saw tremendous growth. Revenue from the line exceeded \$200 million in fiscal 1991—double that of a year ago. Data General expects that to continue. "AViiON has consistently grown from quarter to quarter," says Stephen P. Baxter, Data General's vice president of corporate marketing. "It has grown in the market segments we said we were going to go after, and we continue to see that across the board on a worldwide basis." Baxter adds that most of those AViiON sales have been high-end servers—and most have gone to new customers.

And the AViiON was not the only system that saw growth in 1991. Baxter says that DG sold \$100 million worth of Eclipse systems to new customers. Data General introduced four new models to the line last year, and in April of this year introduced the sixth generation of its Eclipse minis.

Landing some large contracts also helped. The company estimates that its multiyear contract with the Environmental Protection Agency for AViiON servers will generate revenues of up to \$100 million. A contract with the Maryland Procurement Office of the federal government is valued at more than \$40 million. DG also inked a deal with Petroleos Mexicanos (PEMEX), Mexico's national oil company, for Eclipse MV and AViiON systems and Dasher PCs.

Baxter acknowledges the importance of desktop machines, but sees the server as the glue that will hold the 1990s computing architecture together for most users. DG's ability to offer PCs is, in his view, just a little extra icing.

Whether Data General can regain and then sustain the momentum of 1991 is a question many want answered. Most (\$48 million) of the \$55.3 million first-quarter loss is the result of its layoffs. How well Data General does will depend in large measure on how well the AViiON servers do. —Elizabeth Lindholm

NORTH AMERICAN COMPANIES



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PROFILES



NORTH AMERICAN COMPANIES



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IS Revenue **\$1.20 Billion**

26

INTERGRAPH CORP.
1 Industrial Park
Huntsville, AL 35894
(205)-730-2000

There is a lot for a person to like in the recent past of Intergraph Corp., maker of niche technical workstations and software—such as the way Intergraph won the Navsea Navy deal, for instance. The Navy signed a \$362 million, multiyear, extendable contract with Intergraph to use its systems in oceangoing ship design. Intergraph calls it the largest-ever contract for computer-aided design and manufacturing (CAD/CAM), and the Alabama firm won in the face of tough competition from Computer-*vision* and Sun Microsystems Inc.

And then there's Intergraph's purchase early in 1991 of electronic design automation (EDA) vendor Daisy/Cadnetix Inc. (which it renamed Dazix-Intergraph Inc.) Dazix, combined with Intergraph's own EDA sales, made a solid contribution to revenues and earnings in 1991 while broadening the user base of Intergraph software. This increase in software revenue, which Intergraph estimates at 19.5% of total revenue, makes Intergraph less hardware dependent and thus less susceptible to the downward slide of hardware margins.

With all this, somehow analysts expected more from Intergraph last year than 14.4% revenue growth. Revenue for 1991 reached \$1.20 billion. Earnings increased by 13.6% to \$71.1 million. San Jose-based Dataquest Inc. notes that subtracting Dazix revenues from the corporate total leaves just 6% revenue growth. "One would have expected some growth even with just the purchase [of Dazix]," sniffs Harvey Allison, vice president of Alex. Brown & Sons Inc.

Intergraph treasurer Jim Dorton does his best to place the results in

perspective. He points out that the introduction of competing workstations from Digital Equipment Corp. and Hewlett-Packard Co., and anticipation of IBM's introduction in early 1992 of its low-end RS/6000, forced Intergraph to talk about its own new systems sooner than it would have liked, and earlier than it could deliver them. Intergraph's C400 reduced instruction set computing UNIX workstations and servers, which provide three to six times the performance of previous models, were accordingly introduced in 1991, but did not begin shipping until this spring.

Meanwhile, Dorton suggests, Germany—Intergraph's strongest selling ground in Europe—got so caught up in reunification that users there delayed purchases. International revenue was 46%, down 7% from 1990.

Even more damaging was a slowdown in U.S. government purchases due to nerves in the face of a sluggish economy. Dorton says that government purchases account for 15% of its total sales, so the purchasing pause caused particular pain.

But Intergraph is nothing if not creative. Analysts rank the Dazix portion of the firm as the No. 3 EDA vendor and expect it to perform well as software offerings from its two families are fully melded. Intergraph last year moved to broaden the appeal of its low-end MicroStation software by porting it to Hewlett-Packard's series 700 workstations. The firm also began actively marketing its own systems integration services, moving into another area where margins remain solid.

Intergraph chief executive officer Jim Meadlock retains some strong admirers, such as Kathryn Hale, senior CAD/CAM analyst for Dataquest, who sees the wisdom of not engaging in the commodity end of the workstation market and instead staying firmly in its high-end niche, waiting for growth to come. "Meadlock has resisted the short-term views of Wall Street," she says. "He is building a company that will be

worth something in five years, not just producing quarterly profits. Other CEOs could take a lesson from him." —Bill Sharp

IS Revenue **\$1.17 Billion**

27

CONTROL DATA CORP.
8100 34th Avenue South
Bloomington, MN 55425
(612)-853-8100

The self-inflicted wounds of the 1980s were supposed to be healed by now, but Control Data Corp. still hasn't made a complete recovery. Indeed, the patient suffered a setback in 1991 as the global recession caught the firm in the midst of a difficult change from proprietary mainframes to open systems.

A net loss of \$9.8 million for the year after a profit of \$2.7 million in 1990, and a 9.8% contraction in total corporate revenues to \$1.52 billion, prompted Control Data to seek a waiver on loan covenants with its lenders until a scheduled debt renegotiation at the end of the first quarter of 1992.

In September, the company announced a major restructuring intended to launch its main businesses—computer products, information services (the Arbitron TV rating service, administration of state lotteries) and government computer services—as separate legal entities to more readily attract equity investment and partners.

Against that backdrop, the Computer Products Group turned in a creditable performance in difficult times (revenues were flat at \$647.8 million), and demonstrated with new products and support for its mainframe customers that it has defined its future. In fact, after two years of negative growth, CDC's total IS revenues are estimated by DATA-



MATION to be up 4.5% in 1991 to \$1.17 billion.

"The strategy is in place to go to open systems," says James E. Ousley, president of the Computer Products Group. In fact, he adds, the transition occurred much faster than expected in 1991, challenging sales and support staff to keep up.

It also accelerated the onset of lower margins (40% versus at least 60% for proprietary systems), meaning "we have to sell more open systems to pick up the slack and produce the same earnings," Ousley says. Last year wasn't a good year for that, he adds, "and we missed our objectives."

Central to a successful migration to open systems is CDC's InfoServer 4000 UNIX line of information servers, introduced at the beginning of 1990. The latest and most powerful, unveiled last October, is the mainframe-class 4680, based on the R6000 chip from Mips Computer Systems Inc. The research firm Dataquest Inc. regards that as vital to CDC's future, stressing that, with the 4680, and in particular because of the 64-bit emitter-coupled logic (ECL) R6000 chip, "Control Data, for the first time in years, has within its grasp an edge that potentially will reverberate for years to come."

That's what Ousley hopes. He claims that CDC has sold more than 1,000 of the 4000 series; CDC's revenue from open systems topped \$150 million in 1991, double that of 1990 and a long way from the zero open systems revenues of 1989. He expects another increase of 80 to 100% in 1992.

While the 4000 series is generating new customers, the CYBER-compatible machines are also finding favor with CDC's existing base of 1,400 mainframe users worldwide, who operate more than 1,700 CYBER mainframes and 3,000 workstations.

Keeping those customers happy is a priority, and CDC seems to be succeeding, according to Carolyn Gard, president of the user group VIM Inc. "The biggest concern of proprietary

users was CDC's transition to open systems, but the company is very conscious of that issue," she says. "It has separate vice presidents for each, so no one's feeling left out."

—John Morris



Intel Corp.'s dominance of the microprocessor marketplace—never open to serious question—took on whole new proportions in 1991. Faced with a worldwide recession and battling competitors that were cloning its most popular chips, Intel shrugged and turned in its best financial performance ever.

The company's revenue rose 22% in 1991 to \$4.78 billion, while net earnings rose 26% to \$819 million. In the process, Intel displaced Motorola Inc. as the largest U.S. semiconductor supplier, as ranked by Dataquest Inc. according to worldwide sales.

DATAMATION estimates that 23%, or \$1.10 billion, of Intel's 1991 revenue came from systems sales. Built on a foundation of various Intel chips, the systems products include everything from board-level add-in cards to PCs for original equipment manufacturers (OEMs) to supercomputers. Tom Thornhill, a principal with Montgomery Securities Inc. of San Francisco, estimates that from 50 to 55% of the total 1991 revenue was tied to microprocessors and related products, and about 20% came from memory chips and embedded-control semiconductors.

The key to Intel's 1991 performance was the market's growing infatuation with 32-bit microprocessors, says Gordon Moore, chairman of the board.

Early in the year, the company had to struggle to meet the demand for its 386DX and -SX chips. But once Intel caught up with that demand, it was able to aggressively pursue the development of its second wave, the 386SL and 486 chips, Moore says.

The year also saw Advanced Micro Devices Inc.'s hugely successful introduction of 386 clones, but Moore discounts that competition as a significant factor in Intel's push to deliver its next-generation chips. The market's insatiable demand for ever more processing cycles drives Intel's development pace more than competitive pressures, he claims.

Intel also introduced a number of new system-level products toward the end of last year. Late in 1991, Intel jumped into the local area networking business with a full suite of LAN products based on its chips. Its original equipment manufacturer (OEM) products division also scored a big win by providing the PC system components for Digital Equipment Corp.'s new Eclipse line. And the company reports strong sales of its iRMX For Windows operating system, also introduced last year. The product lets desktop PCs running the Microsoft Windows graphical user interface serve as controllers for machine tools and other factory and laboratory equipment.

Last year also saw the introduction of Intel's new generation of parallel supercomputers, dubbed the Paragon XP/S. By incorporating increasing numbers of the company's i860 XP microprocessors, Paragon XP/S machines can theoretically offer performance rates from 5 to 300 billion floating point operations per second (GFLOPS). The UNIX-based parallel processors are compatible with Intel's existing iPSC/860 supercomputers, which will still be marketed. Intel hopes its parallel machines will broach commercial as well as scientific markets, although success in the commercial realm will require the development of better software, Moore admits. "But I'm convinced



there will be a large commercial market for these computers over time," he says.

By speeding ever more powerful products to market, and by offering a broad range of chip permutations, Intel hopes to stay a step ahead of 386-clone competitors like AMD and Chips And Technologies Inc. The Intel 486DX2 chip, which combines a 50-megahertz processing rate with a 25MHz interface to other system components, should be among the more popular products Intel offers this year, Moore predicts.

All told, Intel expects sell 4 to 5 million second-wave microprocessors during the fourth quarter of this year. That projection represents more than half of the available market, Moore says. Late in the year, Intel plans to introduce its next-generation P5 microprocessors, which will each contain more than 3 million transistors and will approach performance levels of 100 million instructions per second (MIPS).

Along with other U.S. semiconductor vendors, the company hopes to sell more of its products into Japan—the world's largest market for chips. But Moore doubts that U.S. penetration will reach an agreed-upon goal of 20% by year's end. For several years, Intel's Japanese sales have held at the 10% level, and Moore agrees with others who say the U.S. government may have to bring more pressure on Japan to purchase U.S. semiconductors.

Meanwhile, Intel will continue fighting court battles on the home front in an effort to limit the cloning of its 386 chips and other key products. Moore has no illusions that the ongoing string of lawsuits will soon be resolved. "The industry has significant [manufacturing] overcapacity right now, so everybody is looking for where money can be made," he says. "Intel's products sort of stick out like a sore thumb [in that regard]. But we're doing all we can to discourage companies from copying them."

—Dwight B. Davis



IS Revenue \$1.09 Billion

ORACLE CORP.
500 Oracle Parkway
Redwood Shores, CA 94065
(415)-506-7000

Growth, Oracle Corp.'s rallying cry of the go-go 1980s, took a back seat last year to more 1990s-style watchwords such as financial responsibility, customer service and quality. And no wonder. Following years of record growth, Oracle stumbled badly in 1990. That's when the company confessed to overstating company sales, owned up to having shipped faulty software and suffered a bruising stock market pummeling as a result.

Today's more chastened Oracle appears to be a different company, largely the result of swift management action taken last year by Lawrence J. Ellison, Oracle's outspoken president and chief executive officer. In March, Ellison demoted chief financial officer (CFO) Jeffrey L. Walker to Oracle's applications business division; Walker resigned on May 31. The CFO position was awarded to Jeffrey O. Henley, former CFO for Pacific Holding Co.

Ellison then made important changes to Oracle's board of directors. In May of last year, the company announced the addition of board member Regis McKenna, the well-known international marketing consultant. Then, in March of 1992, Ellison convinced Delbert W. Yocam, Apple Computer Inc.'s former chief operating officer, to join the board.

The management and philosophy changes appear to be working. Although 1991 revenues grew just 8.3% to \$1.09 billion, net earnings for the calendar year weighed in at \$76 million (at least officially), a threefold increase from 1990's restated figure of \$20 million. A healthy financial report at the end of the year con-

vinced some analysts to put Oracle back on their buy lists. "We've absolutely changed our culture from growth to quality, and it's largely taken hold," says Ellison.

In trying to heal its financial wounds, Oracle is looking at new markets for its flagship database. The company must deal with the industry shift from proprietary mainframes and minicomputers—the company's traditional stronghold—to UNIX, PCs and client/server technology. "[Digital's] VMS is a declining market for us," admits Ellison, who says Digital sales have been flat for two years. "And in our vision, the IBM mainframe will not be the database server of the future. It's too expensive and slow to do that."

Oracle is making progress in UNIX. It now accounts for at least \$60 million of Oracle's revenues; 70% of the company's new business comes from UNIX and desktop systems. To help boost UNIX sales even more, Oracle last year split its UNIX business into three stand-alone units: generic UNIX, Hewlett-Packard and Sun. And for the nascent client/server PC market, Oracle's Server For NetWare emerged last year well ahead of products from chief competitors Microsoft Corp. and Gupta Technologies Inc.

None of this will matter much unless Oracle succeeds soon in shipping the long-awaited Oracle version 7.0. Many of the advanced features expected in it—referential integrity, stored procedures and two-phase commit—have already been implemented by competitors. Most analysts say that version 7.0, now in beta, isn't likely to ship until late this year or early next. Considering Ellison's new-found obsession with quality, it's not likely that Oracle will ship 7.0 prematurely.

Maybe that's not so bad, though. It was substandard quality that Ellison blames for Oracle's failure to jumpstart its financial and manufacturing software applications business in prior years. But that's now been



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fixed, he insists, and a new company culture is dedicated to getting the bugs out and features in. "It is no surprise that our applications business is where we experienced the quality problems," says Ellison. "But we believe that we have fixed them 10 times over."—*Paul Pinella*

IS Revenue \$1.07 Billion

30

NORTH AMERICA

QUANTUM CORP.
500 McCarthy Boulevard
Milpitas, CA 95035
(408)-894-4000

It was a tough year overall for storage manufacturers, but 12-year-old Quantum Corp. more than held its own, and it passed a major milestone—a billion dollars of revenue in 1991. Quantum's revenues vaulted up almost 50% to \$1.07 billion, leapfrogging over competitor Maxtor Corp., which had revenues of \$961 million in 1991, and jumped from number 39 to 30 on the North American DATAMATION 100.

The first quarter of calendar 1991 was a record for Quantum, one in which it made a \$20 million profit on an unprecedented \$291.3 million in revenue. Analysts attribute the 49.9% revenue gain primarily to demand from Apple Computer Inc., whose Macintosh Classic and LC desktop machines were introduced in the fall. Quantum is Apple's leading supplier of fixed disk drives.

Even so, Quantum concentrated on acquiring new customers in 1991 and, although it continued to ship drives to Apple at the same level throughout the year, Apple plunged from 40% of Quantum's business down to 15%, according to Michael Brown, executive vice president.

Revenue remained steady over the remainder of the year, but profits declined continuously, quarter by

quarter. And, in the end, Quantum's 1991 profits were 25.6% lower than they had been in 1990, sliding to \$49.6 million. "The whole industry was caught with way too much inventory," explains Brown. That, in turn, caused a great deal of price competition. "Prices came down about 40%," says Brown. "The average [price reduction] in our industry is about 20% per year." That meant slimmer profit margins—about 13% for the industry as a whole and 18% for Quantum, Brown estimates.

In the spring, Quantum turned its attention toward its distribution channels, signing agreements with Rein Elektronik and Inelco Peripheriques, among the leading distributors in Germany and France, respectively. In August, Quantum consolidated other distribution channels. It merged its Plus Development Corp. subsidiary, which manufactures a line of "hard cards," hard disks on adapter cards, into its Commercial Products Division. The \$300-million business unit is designed to serve the unique needs of the mass-market distribution channel. Quantum says it allows the company to take better advantage of superstore and other retail channels.

Brown attributes the strong revenue growth to Quantum's time-to-market initiative, which has cut development time from 24 to 15 months, as well as to strong sales of new products. In October, Quantum announced 11 new models of its 2.5- and 3.5-inch drives, and in November it upgraded its line of Passport removable disk drives. The Passport, which is based on Quantum's 3.5-inch ProDrives, have a new design that makes not only the media but the entire head-disk assembly ejectable. This reduces the chance that dust and debris can make their way into the fragile drive machinery when disks are switched.

—*Elizabeth Lindholm*

IS Revenue \$1.07 Billion

31

NORTH AMERICA

TANDY CORP.
1800 One Tandy Center
Fort Worth, TX 76102
(817)-390-3700

The bad news for Tandy Corp. was that, coming into 1991, it was already battling the recession in its retail operations, and further price erosion in its PC businesses only added to an already difficult year.

IS revenues dropped 11% from \$1.2 billion in 1990 to \$1.07 billion in 1991, while profits plummeted 32% to \$176.5 million.

But the good news was that, seizing an opportunity, Tandy quickly established a beachhead in the growing PC superstore market. By year's end, Tandy had eight new outlets sporting the Computer City SuperCenters moniker. And, in a major shift of strategy, these new superstores sell not just Tandy products but PCs and peripherals from Apple Computer Inc., AST Research Inc., Compaq Computer Corp. and IBM.

Tandy's goal for this division is simple: to be the No. 1 distributor of PCs in the United States, says Alan C. Bush, president of Computer SuperCenters International Inc., the Tandy subsidiary that operates Computer City. Analysts say the stores have done well in their first few months. And early this year the Computer SuperCenters announced the creation of a business sales group to service commercial accounts.

But other portions of Tandy's retail operations found less to cheer about last year. The continuing recession made Christmas a little less merry around Tandy's Radio Shack division. There were few celebrations, and more price cutting, as consumer spending went south. Computer sales at Radio Shack stores were further hurt by inroads made into Tandy's

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traditional consumer bailiwick by low-priced PCs from other manufacturers like CompuAdd Corp., Dell Computer Corp. and Gateway 2000 Inc. Tandy cut prices, along with others in the industry, but the company's margins took a beating as well.

All that didn't stop Tandy from offering new products into the channel, including a multimedia PC with a built-in compact disc, read-only memory (CD-ROM) drive, advanced sound capabilities and multimedia software.

Despite the PC bloodbath, Tandy's Grid Systems Corp., which carries the ball for the company in the *Fortune* 500 market, showed increases in its PC sales. Particularly strong were sales of the company's portable-computing devices—including PCs, handheld devices and pen-based systems.

Grid owned the pen-based market in 1991 but may not be so lucky in 1992. IBM, Momena Corp. and NCR Corp. have started to ship products this year. Go Corp. and Microsoft Corp. should have their pen operating systems out the door by early summer. But Grid officials are confident they have a good grip on much of the market. Analysts say the company shipped 15,000 of the machines last year and may sell 40,000 in 1992.

Grid has licensed its own DOS interface, PenRight!, to several other companies, including Poqet Computer Corp. Grid will support the operating systems from Go and Microsoft, as well as its own, in future pen-based products.

Tandy also has another arm in the corporate PC market. It manufactures PCs for Digital Equipment Corp. Since Digital has recently gone on the offensive with its PC line, setting up an 800-number mail order operation, Tandy could see some residual dividends this year from that relationship.

Still, what Tandy needs is not residual dividends but consumers willing and eager to open their wallets.—Bob Francis



IS Revenue \$1.04 Billion

COMMODORE INTERNATIONAL LTD.
1200 Wilson Drive
West Chester, PA 19380
(215)-431-9100

Pioneer PC supplier Commodore International Ltd. reported its best year ever since the halcyon days of 1984 when the hot-selling Commodore 64 home computer pushed it over \$1 billion in sales. In 1991, Commodore reported revenues just a shade past the \$1 billion mark once again. That 4.3% revenue gain was largely thanks to the continuing success of its Amiga family in Europe, traditionally Commodore's strongest market, and strict cost controls that have kept operating expenses lower and margins higher than most competitors, (competitors'). Net earnings rose a healthy 24.6% to \$50.1 million.

Europe is where Commodore continues to show its greatest strength, accounting for fully 87% of its business. Last year, the company increased Amiga unit sales nearly 25% worldwide and 30% in Europe. This, the company says, secures its status as the second-largest PC supplier to Europe behind IBM, and positions Commodore well for future business in Eastern Europe and the former Soviet Union. With both a strong market share and the Amiga operating system as assets, Commodore feels it is well placed for future growth on the Continent.

But Commodore has been hard-pressed to equal this success in the rest of the world, particularly in Asia and North America. Against a backdrop of recession and intense price wars waged by the PC-compatible makers, Commodore watched its U.S. sales slide from 18 to 9% of its sales overall for the fiscal year. Sales in Asia and Australia also decreased from the year before.

"We still have a long way to go in the U.S., but we have marketing plans in place to help make that happen," says Ron Alexander, Commodore's chief financial officer.

A number of new products introduced in 1991 could help turn the tide in the States and elsewhere, particularly as multimedia—always an Amiga speciality—begins to take off. During the year, Commodore introduced the Amiga 500+, an upgrade of its best-selling home computer, and brought out new commercial systems as well, including UNIX and tower versions of the Amiga. Designed especially for professional video production use, these larger, more expensive Amigas were well represented as the company shipped its 3-millionth Amiga in November, only a year after reaching the 2 million mark. Commodore believes the key to increasing U.S. sales lies in these higher-end Amigas used in vertical applications.

The company also moved upscale in its MS-DOS PC family. After discontinuing its line of XT's and AT clones, Commodore introduced a new line of reengineered modular systems, including 486-based PCs.

In addition, Commodore began what it calls a "phased launch" of its compact disc television, or CDTV, player last summer. One of the first CD-based interactive multimedia products for consumers, the CDTV is a low-cost, modified Amiga that attaches to a television set and plays interactive discs coming from third-party suppliers. Commodore believes that the CDTV, like the higher-end Amigas, will also drive U.S. sales higher, not only in the consumer market but in the commercial one as well.

The CDTV began shipping too late in the calendar year to contribute much to Commodore's bottom line in 1991. And because it must compete directly against a similar system from heavyweight NV Philips' GL, it may be a while before the CDTV emerges as a money machine for the company. "We never expected it to be an instant success," says Alexander. "But with



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both consumer and vertical applications, the future of CDTV should be quite promising." As examples of potential vertical applications, Alexander suggests retail store kiosks, corporate-training delivery tools, multimedia catalogs and the like.

—Paul Pinella

IS Revenue
\$995.0 Million

AMERICAN EXPRESS CO.
 American Express Tower
 World Financial Center
 New York, NY 10285
 (212)-640-2000

American Express Co. in 1991 continued its struggle to overcome the damage done in 1990, when earnings plunged nearly \$1 billion, primarily on losses from its Shearson Lehman Brothers Inc. brokerage and investment-banking operations. The company overall posted improved revenues and earnings last year, aided by the strong performance of its renamed IS division, First Data Corp. (FDC), the former American Express Information Services Co.

Total American Express revenue for 1991 rose 5.9% to \$25.8 billion, and net earnings rebounded from an abysmal \$181 million in 1990 to a relatively healthier \$789 million in 1991, generated from segments including Travel Services, IDS Financial Services, American Express Bank, Shearson Lehman Brothers and FDC.

FDC supplies a major share of third-party MasterCard and Visa bankcard transaction processing in Britain and the United States. Ironically, FDC does not process transactions for the American Express card. Nevertheless, FDC processes more than 2 billion transactions annually, and, in addition to bank cards, these include cable television billings, payment products, telemarketing, and health care and mutual funds processing. The company

is also a significant supplier of outsourced transaction-processing services.

FDC revenues climbed 20% to \$995 million in 1991. Earnings rose 14.6% to \$118 million for 1991. FDC attributes about half of its growth to its own business expansion and cost controls during the year, as well as to strong demand for outsourcing services. The remaining growth in revenue is the result of the midyear acquisition of Signet Ltd., which FDC calls the largest third-party bankcard processor in the United Kingdom. Signet is the first FDC operation outside the States, accounting for almost 10% of 1991 revenue. On the downside, credit card processing and telemarketing services were sluggish in the wake of the consumer spending slowdown.

Early this year, American Express announced a public offering of 44 million shares of FDC common stock. This will transform FDC into a separate corporation rather than an American Express subsidiary, although American Express will retain about 60% of FDC's stock. FDC did some creating of its own, forming Integrated Systems Technologies (IST) during 1991. IST manages data center operations for FDC and will sell systems operations services externally as well. The Shareholder Services Group, an FDC segment that provides mutual funds transfers, expanded its services during 1991 and now offers IS services for banks that manage mutual funds.—Bill Sharp

IS Revenue
\$987.0 Million

MOTOROLA INC.
 Motorola Center
 1303 East Algonquin Road
 Schaumburg, IL 60196
 (708)-576-5000

In the five years since the semiconductor manufacturer decided to build microcomputers as well, Motorola

Inc.'s Computer Group has grown by leaps and bounds.

While the recession pummeled many computer firms, Motorola's computers have sailed ahead. Without the baggage of proprietary systems, and with equipment designed from the beginning to run on open systems, its sales have held up well.

Demand was strong for all of Motorola's computer lines: the MultiPersonal series 8000 and Delta series 8000 network server systems, based on Motorola's 88000 UNIX/reduced instruction set computing microprocessor; and the more junior Delta Series 4000 systems, based on the M68040 microprocessor. Major contracts for the series 8000 included Automated Data Processing Inc., Chrysler Corp., Honeywell Inc. and the State of Ohio.

Motorola won't release figures, but DATAMATION estimates the Computer Group's revenues neared \$400 million in 1991, up a healthy 12% from the previous year.

These figures mask some dynamic shifts, however. Tom Beaver, corporate vice president and general manager of the group, says revenues in the Computer Group's North American division soared 58%. But the averages were cut down by a disruption in shipments of microcomputers to the European market after Digital Equipment Corp. bought those operations from NV Philips' GL, a major Motorola customer. Thus, overseas revenues increased only 2%.

A further drag was flat revenues in field service, as the declining cash stream from minicomputers was offset by new revenues from servicing micro lines.

The parent company didn't fare quite so well; overall revenues rose only 4% to \$11.34 billion (after rising 13% the previous year), and net earnings dropped 9% to \$454 million.

And things were also not quite so rosy for the rest of Motorola's IS businesses. DATAMATION estimates Motorola's total information

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35
36

systems revenues last year rose a tepid 3.5% to \$987 million, far short of the 11% growth of 1990. Apart from the Computer Group, the other contributors were the Codex Corp. and UDS/Motorola units, which produce all of the elements for distributed voice and data networks, from basic modems to network management systems.

Codex and UDS suffered a 2% dip in revenue to \$587 million and reported an operating loss that widened to \$13 million from \$1 million the previous year. Codex continued to focus on its transition to the networking systems business, while sharply higher shipments of UDS's popular V.32 high-speed modem generated disappointing revenues due to pressure on prices.

During the year, Motorola broke new ground with two products: in Germany it launched its Altair wireless local area network, and in the United States unveiled its PCRadio computer terminal, which allows remote access to a company's database and voice mail, sends a fax and will receive electronic mail.

—John Morris

IS Revenue

35

\$961.0 Million

NORTH AMERICA

MAXTOR CORP.

211 River Oaks Parkway

San Jose, CA 95134

(408)-432-1700

Restructuring proved costly for Maxtor Corp. last year, as profits declined on increasing revenues for this manufacturer of storage devices for PCs, workstations and large systems. Revenues rose 21.7% to \$961 million, and Maxtor posted a \$65.7 million loss in 1991 after pulling in a \$10.8 million profit the previous year.

Things looked bad right at the start

of the year. In January, Maxtor president and chief executive officer George M. Scalise resigned, reportedly for personal reasons, but the company's board of directors was said to be unhappy about poor performance in the last half 1990. He was replaced in May by Lawrence R. Hootnick, the former president of Intel Corp.'s embedded controller and memory group. Maxtor also laid off 140 U.S. workers in January and eliminated 130 positions at its Singapore manufacturing plant.

Consequently, in March, Maxtor reported a \$49.8 million loss on revenues of \$224 million. About 60% of the loss was due to the restructuring or other one-time costs. But Maxtor posted a further loss of \$10.7 million in the next quarter and the slide continued in the next quarter with a \$9.3 million loss. These losses were also attributed primarily to one-time charges.

Even as the bad news rolled in, Maxtor and its subsidiaries rolled out several new products. At the end of April, Maxtor introduced its Tahiti II 1-gigabyte erasable optical drive. In September, Maxtor offered a line of Apache drives for Apple Computer Inc.'s much-touted PowerBook notebook. In November, Maxtor's Storage Dimensions Inc. subsidiary introduced a line of drives for NetWare local area networks.

But new products alone often can't reverse a company's fortune. In order to improve its position, Maxtor set out to sell off some of its assets. In September, the company started shopping around its Storage Dimensions subsidiary, and in November, Maxtor arranged to sell its headstack assembly plant in Penang, Malaysia, to Read-Rite Corp. for \$17 million. Maxtor received a partial payment on the plant at the end of December, which helped to turn the numbers positive at the end of the year.

The company did finally turn a \$4 million profit in the fourth quarter.

—Elizabeth Lindholm

IS Revenue

36

\$935.0 Million

NORTH AMERICA

MINNESOTA MINING AND MANUFACTURING CO.

3M Center

St. Paul, MN 55144

(612)-733-1110

Staying close to home is good counsel in tough times, and the idea has served the IS portion of Minnesota Mining and Manufacturing Co. well. In information systems, 3M's proven expertise is in backup data storage, and the company made solid moves during 1991 to expand its efforts in this area.

Total 1991 company revenue increased just 2.4% to \$13.34 billion, and earnings dived nearly 12% to \$1.15 billion as the economic downturn slashed demand for several product lines, but 3M's IS performance was better. Thanks to continued growth in memory products, 3M's computer tapes and cartridges, digital imaging systems, diskettes and optical recording products expanded revenues for their segment of the company by almost 7%, according to the Framingham, Massachusetts-based market research house International Data Corp. DATAMATION estimates IS revenue at \$935 million.

Capitalizing on its memory success, 3M announced plans to expand its 1.35-gigabyte 1/4-inch, 5.25-inch-format data cartridge family over the next three years with products boasting 10 and 35GB capacities en route to providing 100GB capacity by the end of the decade. This monumental memory maneuver will be accompanied by ongoing improvements in data transfer rates, increases in track densities and development of a high-accuracy servo-positioning system.

Meanwhile, 3M is boosting the capacity of its 3.5-inch mini data

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cartridges. Expect capacities in this format to grow to 400 megabytes by year's end, and reach 3GB by early 1994, suggests Stan Corker, director of removable storage research for International Data. These products will be directed at the rapidly growing workstation marketplace.

The data cartridge business has been so successful for 3M that the firm stopped making the drives themselves two years ago to avoid competing with its own customers, the other drive makers. 3M chose instead to concentrate on making the cartridges and license the drive technology to other producers.

"3M makes the most money of any of the 1/4-inch tape companies, so they are reinvesting the money in research for follow-on technology to increase capacity and performance," says Corker. "Once they develop the technology, they then license it to the drive manufacturers."

The company is well aware of the importance of new product technology. Despite its lackluster overall corporate performance, 3M reports increasing its research and development as a percentage of sales for the year to 6.85%. These ongoing investments in research produced a noteworthy accomplishment in 1991 that may improve data capacities of optical and compact disc technologies. Last summer, 3M announced development of a long-sought blue-green laser diode. This innovation, which uses shorter wavelengths than current red and infrared lasers, could dramatically improve data densities for optical recording, imaging, printing and communications applications.

Management motion was also strong for the year, as nearly half of the firm's top executives swapped suites around the globe. At the top, retiring Allen F. Jacobson was succeeded by Livio D. DeSimone as chairman and chief executive officer.—*Bill Sharp*

IS Revenue \$889.9 Million

NORTH
37
AMERICA

DELL COMPUTER CORP.
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If 1991 was a recession year, someone forgot to tell Dell Computer Corp. The then six-year-old PC manufacturer left most other PC suppliers in a cloud of Texas dust, racking up a 63% increase in revenue to \$889.9 million as it doubled overseas sales.

But as its astounding 87% rise in net earnings attests, the premier telemarketer in the PC industry didn't do it just by lowering prices. Dell racked up its \$50.9 million profit through some important wins in terms of service and support. Dell scored No. 1 on the J.D. Power & Associates computer-customer satisfaction ranking at small and medium-sized companies. It also ranked high in service in a Dataquest Inc. survey. DATAMATION readers were right in there, giving the Austin, Texas-based company higher marks in PC service and support than industry giants IBM and Compaq Computer Corp. Those votes were cast in DATAMATION's fall 1991 survey of IS managers' intentions to purchase mini and microcomputers, conducted jointly with New York City-based Cowen & Co.

Dell has upped the ante in the service and support game, offering in several major cities on-site maintenance within two hours via BancTec Service Corp., a Dallas-based PC network service firm.

Like others in the PC business last year, Dell was forced to lower prices as PC clones continued to flood the market. But the declines barely caused a ripple in Dell's profits due to some aggressive cost controls. Besides AST Research Inc., Compaq and IBM, Dell competes with such upstarts as CompuAdd Corp., Gateway 2000 Inc., Northgate

Computer Systems Inc. and Zeos International Ltd. And these agile newcomers are making their presence felt: Gateway 2000, for example, ran over Dell in the U.S. market, racking up \$635 million in domestic revenues, some 30% more than Dell's \$480 million U.S. take.

In response to such competition, Dell made some shifts in its distribution strategy last year. The company began selling some products through the CompUSA Inc. computer superstore chain and Staples Office Supply Store Inc. This year, Dell's products will see the light of day in The Price Co.'s Price Club warehouse chain, replacing Packard Bell as that company's PC supplier. Mail order sales, though, continue to account for three-fourths of all revenue, company officials say.

That distribution and service model is also selling well overseas. Building on a solid overseas base, Dell has set up telemarketing services in 12 European countries and has just announced that it will enter South America this year through a deal with Xerox Corp. "What we've found is that the business model we have in the U.S. is equally strong overseas," says Andrew R. Harris, senior vice president for international sales and marketing. Indeed, international revenues accounted for 36% of Dell's revenues last year, up slightly from 34% the previous year.

In 1991, Dell unveiled 22 new desktop and portable PC products. Stretching a relatively lean \$33.1 million research and development budget, a mere 3.7% of revenue, Dell made many of those products from a fair number of off-the-shelf components. According to J. Michael O'Dell, vice president of systems development, using off-the-shelf components lets Dell's 125 engineers and programmers focus on innovations that will add more value to the product. In its laptop models, for instance, Dell designs its own microprocessors to manage battery use and has filed six patents related to that work.

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Although Dell's top management has remained stable for the past few years, the company has added some experience in an advisory capacity. Former Electronic Data Systems Corp. chief executive officer Morton Meyerson spends about a week a month at Dell advising the company's managers, and former EDS counsel Thomas Luce has been named to the board of directors.

But perhaps the most telling sign that Dell's strategy had made an impact on the computer industry comes from its competition. Digital Equipment Corp. began its "Digital Direct" campaign last year, allowing corporations to purchase Digital's PCs over the phone, in a strategy very similar to Dell's. And IBM and Compaq may follow suit.—*Bob Francis*

tems and more competition all around as a main reason for the lack of profits.

Cray prides itself for being a technology-driven company and seemed to realize that some marketing jobs are best left to others, particularly in the unfamiliar minisupercomputer field. In January 1992, just two months after announcing a new entry-level system, the Y-MP EL (priced from \$300,000), Cray effectively handed over all marketing and sales rights for the system to Digital Equipment Corp.

The two companies then tightened their relationship further. Cray has decided to use Digital's 64-bit Alpha reduced instruction set computing microprocessor for its first-generation massively parallel processing (MPP) system, due for delivery in 1993. No chip decision has yet been made for the second- and third-generation MPP supercomputers due out in 1995 and 1997, respectively.

The issue of MPP systems have dogged Cray for the last few years. Although it remains to be seen if MPP systems will offer any tremendous price/performance breakthroughs, or if software can be refined enough to handle hundreds or even thousands of microprocessors, MPP is seen as the hot new technology not only by Cray but by a slew of competitors hot on Cray's trail.

"Our primary goal in bringing MPP technologies into the mainstream supercomputing marketplace is commercial viability—the system's ability to help a broad base of users solve real-world problems faster than ever before," states Cray chairman and chief executive officer John A. Rollwagen.

So while Cray continues to boost its Y-MP vector-processing technology, it can't ignore the host of companies building MPP systems. It received a boost when the Defense Advanced Research Projects Agency (DARPA) agreed to contribute \$12.7 million toward Cray's MPP program. Yet Cray now finds itself in the posi-

tion of needing to support two separate architectures and somehow to closely integrate the two.

Meanwhile, the company continues to enhance its traditional supercomputer line. In November, Cray announced the Y-MP C90, which operates at four times the speed of Cray's previous fastest computer and carries a price tag in the \$30 million range. Analysts believe Cray will ship seven C90s in 1992. The C90 was important to Cray, as the company saw some sales of its previous-generation supercomputers slip away to competitors Fujitsu Ltd. and NEC Corp.

In other developments, Cray acquired most of the assets of bankrupt Floating Point Systems Inc. for \$3.25 million and created a new subsidiary that will make high-end servers based on Sun Microsystems Inc.'s SPARC RISC technology. Sun and Cray say they will work together to tie Sun systems in with Cray supercomputers.

On the executive front, 15-year Cray veteran John F. Carlson was named president and chief operating officer in September, filling the spot left by Marcelo A. Gumucio, who resigned back in July 1990. The company also created and filled the new post of chief technical officer with executive vice president Lester T. Davis.—*Susan Kerr*



Many consider 1991 to have been a transition year for Cray Research Inc. Faced with increased competition and tighter budgets, Cray responded with a barrage of products and agreements designed to keep its traditional supercomputer customers satisfied while bringing in a new class of users at the low end of the market.

With 1991 revenues totaling \$862.5 million and net earnings standing at \$113 million, there's no doubt that the squeeze may be on at Cray. Although the company was able to produce adequate revenue growth of roughly 7%, net earnings were flat. Company officials predict that 1992 holds more of the same: revenues up approximately 8 to 10% with no increase in earnings. Analysts cite Cray's move to sell more lower-priced, lower-margin sys-



General Electric Information Services (GEIS) contributed about \$650 million of the revenues reported by General Electric Co., thereby providing the bulk of GE's IS revenues in



1991. DATAMATION estimates General Electric Co.'s total IS (which includes hardware maintenance revenues from other operations) to be \$850 million, up 6.3% from 1991.

GEIS's \$650 million is barely 1% of GE's total take of \$60.24 billion and \$2.6 billion in net earnings. Nevertheless, it's a key element in the company's worldwide business communications activities. For example, \$16 billion of the \$60 billion in payments to GE last year were sent over an electronic payments system that GEIS developed. Called Customer Originated Electronic Payments (COEP), it enables both GE and customers of the company's electronic data interchange (EDI) service to collect receivables electronically. This is expected to be one of the major by-products of EDI for the company in 1992, says Dennis J. Crane, GEIS's vice president of marketing.

EDI, the paperless transmission between customers and suppliers of purchase orders, shipping notices, invoices and order acknowledgments, is GEIS's fastest growing business, rising 40% last year. GEIS provides the networks that transmit the data between the trading partners' computers, as well as services over those networks. Transmission, and such services as electronic mail and messaging, grew at a 25 to 30% mark, says Crane. Overall, GEIS business is growing 10%.

Last year, the company signed up its 10,000th EDI trading partner, H.J. Heinz Co. Australia. Ltd., a wholly owned subsidiary of processed food giant H.J. Heinz Co. Trading partners consist of large buyers and their multiple medium-sized and small suppliers. GEIS has been adding such customers of its value-added network at the rate of 2,000 a year for the last three years.

GEIS and other value-added network providers furnish electronic mailboxes for EDI partners to send and retrieve EDI messages. GEIS calls this service EDI*Express. It also provides software that translates dif-

fering industry codes into a common language (EDI*PC System, version 7, and EDI*Central System). More recently, GEIS and other value-added network purveyors have been providing PC-based mapping software that lets trading partners integrate EDI functions into their own in-house applications, so that data from the applications need not be rekeyed to be transmitted through EDI. They also help major customers acquaint smaller suppliers with EDI.

This year, GEIS began offering a Bank Agent Program to allow banks to provide both EDI and electronic funds transfer (EFT) services to their customers. Suppliers receive remittance notices from their customers, while payment transfers are exchanged between their banks.

Other new products included enhancements to existing offerings. In May 1991, GEIS began offering a communications software system to the sales automation market. It automates such functions as lead tracking, order entry, scheduling, tickler file notification, forecasting and call reporting in a far-flung enterprise.

GEIS also made available what it calls a streamlined version of its UPC*Express catalog service, which lets users look up the identification numbers of more than 90,000 uniform product code council (UPC) manufacturers either on line or in batch mode. One customer, Dayton Hudson Corp.'s Department Store Division, is already accessing more than 70 vendor catalogs through the service.

Early this spring, GEIS also announced an enhancement to its QuickNews Service—a personalized electronic news-clipping service that is delivered to subscribers' e-mail boxes. The enhancement allows customers greater freedom to tailor the kinds of news they order to their specific business interests.

Crane says GEIS expects international standards compliance to have a major impact on its 1992 revenues. He says GEIS had 16 interconnections to other X.400 public service networks

and will add another 12 in 1992. X.400 is a messaging standard promulgated by the Consultative Committee on International Telephony and Telegraphy (CCITT). GEIS's GEMS 2000 (for GE Messaging System), driven by another CCITT standard, X.500 for electronic mail directory services, has been deployed throughout GE, linking 75 different messaging systems. But Crane says GEIS won't offer the system to the public before "well into 1993."—Tom McCusker



IS Revenue **\$828.9 Million**

NORTH AMERICA

LOTUS DEVELOPMENT CORP.

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Lotus Development Corp. should have had a lousy 1991, judging by the most important product announcement from the spreadsheet, communications and CD-ROM software giant. After long and embarrassing delays, Lotus 1-2-3 For Windows debuted only to be battered by lukewarm reviews, reports of bugs and slow sales. Not exactly the assault Lotus envisioned against Microsoft Corp.'s Excel, the one product ever to seriously threaten Lotus's long reign over the PC spreadsheet market.

Things looked shaky in the executive suite as well. Several key execs of vice presidential rank or better left for greener pastures last year. The highest ranking one was senior vice president Frank King, replaced by John Landry, formerly of Dun & Bradstreet Software Services Inc.

What's worse, Lotus suffered its biggest layoffs ever, reducing staff by 10% through a combination of attrition, restructuring and layoffs.

But, all things considered, Lotus had a pretty good 1991—a record



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year, in fact, in terms of revenue, which climbed 19.7% to \$828.9 million, keeping it the No. 4 U.S. independent software maker on the North American DATAMATION 100. But the net earnings of \$43.1 million, although 85% higher than 1990's level, were lower than analysts had predicted, thanks to a hefty \$23 million restructuring charge taken in the fourth quarter.

Last year's profits would have fallen below 1990's level had Lotus not taken a one-time \$53 million hit late in 1990 related to the acquisition of Samna Corp. and its Ami Professional word-processing package.

Still, Robert K. Weiler, senior vice president for Lotus's North American Business Group, says 1991 "absolutely returned us to dominance in the spreadsheet market," citing a 60% share of the overall spreadsheet market (Excel notwithstanding), and a 90%+ share of the MS-DOS spreadsheet market.

Lotus may begin to gain some of the Windows spreadsheet market following its April shipment of 1-2-3/W 1.1, an upgrade Weiler says overcomes the performance flaws of the first release. In addition to Windows and MS-DOS, Lotus spreadsheets now support NeXT, VAX/VMS, Sun SPARC, Macintosh System 7, OS/2 (release 1.1, with a release 2.0 version on the burner), IBM-compatible mainframe and Hewlett-Packard Palmtop operating systems.

And spreadsheets aren't even the big story for Lotus anymore. President and chief executive officer Jim Manzi is following the money trail blazed by the company's Notes groupware and cc:Mail electronic mail package for local area networks. Revenue from cc:Mail nearly tripled in 1991, and the package was selected by big customers like the U.S. Navy, which will hook up 80,000 cc:Mail users in the next three years, Lotus states. Says Manzi: "We believe the communications business offers one of the greatest opportunities for new growth."—Ned Snell

AST RESEARCH INC.
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AST Research Inc. grew almost twice as fast in 1991 as it did in 1990, as revenue swelled 41.1% to \$827.3 million, far outpacing the previous year's 21.7% gain. If its 1992 revenue growth sustains last year's pace, AST will become a billion-dollar company well before December. Not bad for a PC maker that was started a dozen years ago by three immigrant entrepreneurs who put their homes in hock to get the business going.

Yet the secret of this success is no secret at all, according to president and cofounder Safi U. Qureshey: "We get paid for execution. Our strategies are obvious—everybody knows about them."

Qureshey calls AST's core strategy "value marketing—having the right product at the right time at the right price." AST rarely makes the fastest, cheapest or most avant-garde PCs; instead, it aims at superior price/performance and support in a multibrand strategy that addresses every major market—and many niches too.

Getting products to market at the right price has its price, however. Net earnings rose a merely respectable, but by no means impressive, 33.7% to \$70.2 million in 1991, while its ratio of earnings to revenue slipped a bit to 8.4%. Also, a stronger dollar affected the 41% of revenues coming from overseas.

AST began 1991 with three main product lines. The Premium PCs, with upgradable processor/memory boards, and Exec notebooks (designed and built in house), both are aimed at *Fortune* 500 buyers, while the Bravo desktop PCs are intended for smaller firms with tighter budgets.

During 1991, AST further diversified its product offerings, introducing the

Advantage! notebook and desktop PCs for the consumer retail market. The company also added network servers to its Premium line and announced the MicroFrame symmetrical multiprocessor superservers, due this summer.

The MicroFrames will compete with IBM AS/400s and other midrange systems. So AST is building relationships with value-added resellers of minicomputers and teaming with software houses to port over mini-based vertical applications. Similar micro-based projects are planned, such as 1991's joint venture with computer-aided design vendor CalComp to produce the micro-based Medallion CAD workstation.

Internationally, AST produced a line of bilingual PCs for the new Japanese DOS/V standard.

This spring, AST introduced the new Power Premium desktop series featuring built-in accelerated graphics for Windows and other graphical environments. And the year is far from over for this fast-moving vendor.

—Lee Thé

TEXAS INSTRUMENTS INC.
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Texas Instruments Inc.'s Information Technology group was a bright spot in an otherwise slow year for the chip and computer maker. IS revenues grew 6.8% to \$747.9 million. While that was nowhere near the previous year's 20% climb, it was twice as strong as the parent company's 3.3% revenue gain to \$6.78 billion, which itself was entirely swallowed up in a massive \$409 million loss.

The IT group accelerated its shift toward software, making its Information Engineering Facility (IEF) computer-aided software-engineering (CASE) tool available on an

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ever-widening range of hardware platforms, and signing marketing agreements for IEF with Hewlett-Packard Co. and IBM. TI also added overseas technical support for the IEF product line and a kanji version for the Japanese market.

A new Enterprise Systems business, launched "with vigor" in 1991, according to IT head John W. White, furthered the shift toward software and services. The unit will sell software for what TI calls "critical internal functions," such as computer-aided design and manufacturing (CAD/CAM), marketing and procurement. TI also sold off all of its industrial automation and control systems business and acquired the European information-engineering business of James Martin & Co. The James Martin acquisition, says White, was needed to bolster global support for TI's software and services.

On the hardware side, TI's notebook-sized computer, unveiled in 1991, captured 7 to 9% of the worldwide notebook computer market by year's end, says White.

Other segments of TI didn't fare as well last year, however. Cuts in defense spending, lower prices for its dynamic random access memory (DRAM) chips and a slow economy contributed to its mounting losses—the 1991 \$409 million loss came on the heels of \$39 million in red ink in 1990. Beyond market factors, the losses involved charges taken for cost-cutting measures that included layoffs and a restructuring of business processes. Other charges represented start-up expenses associated with the construction of new semiconductor-manufacturing capacity.

The outlook by the end of this year should be better. TI's new chip-manufacturing capacity will reduce production costs, making up for some of the drop in chip prices. In defense, TI's high-speed antiradiation missile (HARM) figured prominently in the 1991 Persian Gulf war, and the company is in a good position to attract the defense dollars still out there,

says White. But analysts say TI won't start making a profit from operations until at least the fourth quarter of 1992.

The IT group and its CASE tools have been a catalyst for restructuring business and manufacturing processes throughout TI. As the economy begins to recover in late 1992, says White, a newly streamlined TI will be in prime position to move with it.

—Leila Davis



The conservative strategies—and image—of Big Six accounting firm Price Waterhouse served it well in its information services consulting practice in 1991. Last year, PW continued to push heavily to keep its costs at 1990 levels and focused tightly on core industries and services, avoiding outsourcing and reselling. As a result, Price Waterhouse's IS business has maintained its 25% growth goals. Price Waterhouse's worldwide revenues were actually up 25.7% to \$733 million from its information services consulting businesses in 1991. The company's total worldwide revenues rose 25.1% to \$3.60 billion.

Price Waterhouse has focused its information services businesses on large companies in large industries, where the accounting firm's restrained approach meshes well with its customers' corporate cultures. Its targeted industries are financial, manufacturing, public utilities, petroleum, insurance, retailing and government.

In the past, as much as 30% of PW's integration work has been for the government sector, but that figure is

now down to 10%, according to W. Dale Young, managing partner for PW's U.S. Open Systems Integration group in Bethesda, Md. He attributes the decline in government work as a percentage of business to the faster growth in commercial integration work rather than to any drop in business from the public sector.

PW does not resell hardware or software, but instead forms marketing agreements with the vendors to work with their clients as consultants and integrators. The few outsourcing agreements Price Waterhouse has pursued have been either to manage an experimental department for a client or to manage a facility while it was being reengineered by PW consultants. In any case, outsourcing is seen as an interim service, according to Young.

PW has set its sights on a few core services as well as industries, says Young. Those are application software package installation, industry-oriented application software developed in house, business process transformation and systems integration. In 1991, the hottest areas for PW proved to be business process transformation, reengineering and open systems.

Price Waterhouse is beginning to make some headway in reengineering with its Arrae family of reengineering tools. Even though interest in reengineering is picking up, analysts say PW has had an uphill battle to build a market for itself over the past three years. Still, PW is an early player in this new market and is expected to be in a good position for future growth.

The biggest competitor PW has had to face over the past year is the economy, according to Young. Many of its targeted industries felt the recessionary pinch, so PW clients are doing more in house these days instead of hiring consulting services, Young believes.

There has also been a change in the typical contract when the firm does win a bid. "The very large contracts for \$20 million or so are just disappearing. The ones already under bid have just dwindled away, and no new

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ones of that size are coming up," he says. "Instead, we are doing pretty well with a number of \$5 million contracts. Clients are finding those more manageable right now."

"It is a good thing we've kept our costs in check," Young concludes. "Now, we are at 85% utilization and have a six-month backlog—we may have to start doing some hiring."

—Leila Davis



Novell Inc. last year firmly established itself as a one-stop source for network-operating systems. It did this through a flurry of acquisitions and alliances, including a distribution and support pact with IBM that has started to account for 5 to 10% of its NetWare network-operating system sales.

The strategy paid off handsomely, leading to a formidable 68% increase in net earnings to \$184 million and to 1991 revenues of \$710 million, a 35% increase over the previous year that was more than double 1990's revenue gain.

And the key to it all was the agreement with IBM, says James R. Tolonen, Novell's chief financial officer. That changed Novell from being a player in the smaller, departmental markets and gave the company credibility in larger corporatewide markets.

In addition to the pact with IBM, Novell in 1991 sought to strengthen its connections to other major computer vendors. The company reached an agreement with Hewlett-Packard Co., similar to the IBM agreement, under which both companies will develop products that operate in each other's

environments. HP also receives the right to market, service and support Novell's NetWare worldwide.

Novell also captured a DOS operating system capability with the acquisition of Digital Research Inc. in late October, which it will operate as a wholly owned subsidiary, renamed the Digital Research Systems Group. DR is the originator of CP/M, the first PC operating system, and its present products include DR DOS 6.0, Multiuser DOS and the FlexOS operating system for point-of-sale and process control systems.

Novell in December acquired a 55% interest in a joint venture with AT&T's UNIX System Laboratories Inc. The company, called Univel, was set up to develop general purpose applications to run under AT&T's UNIX operating system. Initial products will be offered under release 4.1 of UNIX System V. Novell acquired a 5% interest in USL in April for \$15 million, and its chairman, Ray Noorda, is a member of USL's board.

Sales of NetWare accounted for 80% of Novell's 1991 revenues. Other software revenues, accounting for 9%, came from communications and database products that support NetWare, as well as from network analysis, monitoring and Transmission Control Protocol/Internet Protocol (TCP/IP) communications protocol products. Hardware revenues contributed the other 11%.

Novell took some of the healthy profit it had made in 1990 and thrust it into product development, which rose 31% in 1991 to \$77.9 million. The result was new versions of NetWare (versions 2.2 and 3.11, with a built-in TCP/IP protocol). The company also announced links to IBM's NetView network manager. Along with version 3.11 of NetWare, Novell offered applications in the form of modules that can be loaded onto the network as needed. Called Network Loadable Modules (NLMs), they include NetWare for UNIX; for Sun Microsystems Inc.'s Network File System (NFS); for the Macintosh; and for IBM's File Transfer, Access and Management/Manipulation (FTAM) and

Systems Application Architecture (SAA).

Novell also brought out a poor man's network-operating system called NetWare Lite, priced at \$99 per node, in contrast to NetWare 3.11, which for small groups of users (say, 10) can cost as much as \$249 per node. It is Novell's response to the growing acceptance among smaller users of Artisoft Inc.'s LANtastic.

Novell reports overseas sales continuing to grow, rising to \$280.3 million in fiscal 1991, which ended in October. That was 42% more than in 1990. Early this year, newly formed Novell Japan Ltd. began shipping a Japanese translation of NetWare For Apple Mac network software. NetWare For Macintosh J will run as an NLM on the Japanese version of the NetWare operating system.

Looking forward, Tolonen says that Novell and IBM together have defined 32 specific development projects to be built using IBM's Systems Application Architecture (SAA) or to work under NetView. "That is where the long-term commitment by both companies to interoperability is being developed," says Tolonen.—Tom McCusker



If the Packard Bell name just resonates with quality for you, that could be because it was once the name of a highly popular brand of console radio—back when that medium was a chief source of home entertainment. But the Packard Bell whose computers you see in every Sears and Wal-Mart is an enterprising young company—founded in 1986—which purchased the name, logo and even the slogan ("America grew up



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listening to us. It still does") of the older, now-defunct consumer electronics firm.

Privately held until early 1992, the new Packard Bell has been tight-lipped about its exploits in the home-office and small-business markets. But with its public stock offering in March of this year, results of the company's carefully plotted, craftily executed assault on consumer retail channels were made known. To say the least, the spoils are impressive: \$676 million in net sales for calendar 1991. That's up 30.5% from \$518 million in net sales for 1990 and an increase of almost 100% over \$338 million in 1989. The company also reported net earnings of \$4.6 million.

According to Bruce Stephen, PC industry analyst with International Data Corp. in Framingham, Mass., Packard Bell shipped 250,000 units in the U.S. market alone last year for a 4.3% share of market—placing it second only to IBM and Compaq. "Packard Bell has a simple strategy: market penetration," Stephen observes, noting that in 1991 the company garnered 28.2% of all PC sales in the rapidly expanding mass-merchant distribution channel. With shelf space at more than 4,000 U.S. retail outlets, Packard Bell far outstrips its closest competitors, AST Research Inc., Dell Computer Corp. and Everex Systems Inc.—all of which have attempted late entry into the mass merchandise market.

Packard Bell's tight grip on retail channels does have its drawbacks, however. Unlike low-overhead competitors, such as Gateway 2000 Inc. and Zeos International Ltd., which operate almost strictly through direct-mail channels, Packard Bell must contend with retail headaches that can hammer away at its profit margins. High product return rates—resulting from retailers' liberal exchange policies—consistently trim the company's gross sales by 15% or more. In fact, Packard Bell's 1991 gross revenue reached \$819 million, but that figure included \$143

million worth of products that were eventually returned.

And because many merchandisers prefer not to compete head-to-head on price, the company must maintain several "exclusive" product line names for its basic PC configurations. Axcel, Executive, Force, Legend, Packmate and, of course, Packard Bell, are all brand names used by Packard Bell resellers in the United States.

While the company's success with U.S. consumers is indisputable, industry analysts have begun to question where Packard Bell can grow from here. One logical strategy would be to transplant its retail channel approach to other consumer markets, particularly in Europe. But IDC's Stephen thinks replicating a U.S.-style distribution network in Europe's complex international market might prove difficult. Although Packard Bell saw its European sales leap by 136% to \$58 million in calendar 1991, European business still accounts for only 8.6% of the company's overall annual revenue, and at present Packard Bell Europe has few established retail relationships outside the United Kingdom.

George Thompson, senior analyst at Datapro Information Services Group of Delran, N.J., thinks Packard Bell's primary objective should be to penetrate the U.S. corporate market. But this, too, could prove daunting. Competitors like AST and Dell have established footholds in corporate accounts by pumping money into research and development and delivering state-of-the-art products at affordable prices. Packard Bell, however, is a guerrilla marketer, not a technology innovator, and doesn't have the resources to pursue a technology-driven strategy. "Even price-conscious corporate customers expect more in the way of advanced functionality than home users do," says Thompson, "and as of today, Packard Bell can't provide it."—Don Marks

IS Revenue
\$653.0 Million

**SCIENCE APPLICATIONS
INTERNATIONAL CORP.**

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Like most companies with strong links to the defense industry, Science Applications International Corp. has been under the gun in the past couple of years to find new outlets for its mainly military or defense-related product sets and services.

Last year, the company did a bang-up job of doing just that. Overall revenue increased by 10% to \$1.28 billion, and IS-based revenue grew even faster, up by 14.8% to \$653 million. To keep up with its increase in sales, the company also boosted hiring by 11% in 1991.

Where's all this growth coming from in a demilitarizing economy? Here are some examples of where SAIC is finding its new customers:

Florida's Orlando-Orange County Expressway Authority gave the company a \$15.4 million multiyear contract to develop and install an electronic toll collection system last year. SAIC will be using technologies it developed for the Department of Defense to track nuclear weapons; the civilian version of the technology, known as automatic vehicle identification (AVI), identifies each participating auto as it passes through toll booths, then debits each auto owner's account at the end of the month.

The federal Environmental Protection Agency awarded the company a multiyear, \$100-million-plus contract to create a systems development center for the agency in Washington, D.C., and to develop a standardized data-gathering and -processing system for EPA offices nationwide. The project is similar to one SAIC has managed for the Department of Defense in the past.

Of course, these aren't the only ways



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in which SAIC is beginning to shift away from its dependence on defense spending. The company is also moving to shore up its system integration activities and outsourcing services. Last year, systems integration and consulting represented about 25% of revenue; facilities management accounted for another 4%. All told, SAIC has about a \$2 billion backlog of systems integration services orders in the bank, along with another \$1 billion in software development contracts.

"SAIC expects the integration services business to grow at an annual compound rate of 15 to 20% in the 1990s," says James E. Russell, senior vice president at SAIC's McLean, Va., offices. "In the next five years, SAIC expects to double in staff and revenue, and we forecast that one-half of this growth will come from the integration services business."

SAIC, with 200 offices worldwide, is wholly owned by its 13,510 employees and has been since it began in 1969.

—J. William Semich

IS Revenue

47

\$639.0 Million

NORTH AMERICA

SILICON GRAPHICS INC.
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For Silicon Graphics Inc., a company fused to keeping a low profile, last year proved to be a bit of a coming out party. Focusing on high-end graphics technology for the technical-computing market was still its prime directive. But new lower-priced systems, the Indigo and the Crimson lines, have moved the company toward the limelight of the middle range workstation market—and into the public eye.

And as if that weren't enough, Silicon Graphics stepped squarely into the klieg lights in the company of the summer blockbuster film *Terminator 2*,

when its workstations were identified as the engines behind many of the special effects. In particular, the workstations conjured up the "morphing" sequences, in which bodies mutated, on camera, into other bodies, various weapons and, in one case, even a linoleum floor.

But morphing muscle men wasn't necessarily the high point of the year for Silicon Graphics. The company's revenues grew an impressive 32.3% to \$638 million. Still, that was short of the 41% rise of the previous year, and 1991 net earnings were down 8% to \$36.6 million. The company says it remains committed to the technical side of the visual-processing market, but both the revenue growth and the earnings dip came from the shift to the lower-end workstations, which at prices starting in the \$10,000 range brought in many revenue dollars, but at low margins.

Although Silicon Graphics is no Dell Computer Corp., it has been using an 800 number to sell the lower-priced machines. The idea is to direct potential customers to dealers. Those products have gone down well with customers, analysts say.

Silicon Graphics's workstations and servers are built around reduced instruction set computing microprocessors from Mips Computer Systems Inc. Soon, however, it may be building them itself, as it announced in March of this year that it was merging with Mips. Assuming the merger goes through, Silicon Graphics will likely take control of most, if not all, of Mips's systems business, which will add even more lower-priced offerings to the company's mix. The marketing and licensing divisions of Mips will become a subsidiary of Silicon Graphics called Mips Technologies Inc.

The downside to the merger is the risk that the Mips architecture will now be perceived as a captive, vendor-specific platform. Analysts see that as unlikely—but it is likely to be brought up by Silicon Graphics's competitors (like Hewlett-Packard Co., IBM or Sun Microsystems Inc.).

Besides supplying Silicon Graphics

with its chips, Mips was also a partner in the Advanced Computing Environment (ACE) consortium. Silicon Graphics has gradually become a more important player in that group, a position the merger with Mips will only increase. According to Richard Chu, analyst at Cowen & Co. in Boston, the merger with Mips should give the combined companies a significant technology advantage in the competitive workstation market.

Compaq Computer Corp. has also been a partner in the ACE group and had an equity interest in Silicon Graphics as well. But as Compaq began to focus on its core PC business, it decided to end its investment, which it did when Silicon Graphics bought back its stock in February 1992.

—Bob Francis

IS Revenue

48

\$635.0 Million

NORTH AMERICA

GATEWAY 2000 INC.
 610 Gateway Drive
 North Sioux City, SD 57049
 (605)-232-2000

If you're looking for reasons why Compaq Computer Corp. chief executive Rod Canion lost his job last year, an aggressive little company called Gateway 2000 Inc. might come to your attention. For the last five years, this lean, mean mail-order machine has been selling IBM PC-compatibles at wholesale prices and making life progressively more difficult for PC industry big shots.

Just look at that number—annual revenue of \$635 million for 1991. That's more than twice the prior year's take. And every byte of that business was transacted through direct mail. No costly distribution channels, no tricky retail relations, no niche positioning, no shelf space woes. Just clear, 1-800-number, you-ask-for-it, we'll-ship-it-to-you, direct sales.



THE DATAMATION 100

PROFILES 26-50



According to Bruce Stephen, director of PC hardware research at International Data Corp. in Framingham, Mass., all that revenue amounted to about 235,000 units shipped—enough to make privately held Gateway the No. 6 vendor of personal computers in the United States in 1991, in IDC's estimation. "One year ago," says Stephen, "Gateway was 19th in terms of market share with about 1%. This year, they've got 2.4% of the market. According to our estimates, that makes them the fastest growing PC vendor in the U.S."

There are, of course, downsides to phenomenal growth. Gateway nearly tripled its work force in calendar 1991, adding almost 1,000 employees to its existing 400. That may seem like rapid deployment in a recession-racked economy, and it is. But when you look at Gateway's ratio of workers to revenue dollars, you realize that this company is still in the enviable position of generating approximately \$450,000 per employee. That should give John Akers at \$188,000-per-employee IBM something to think about as Big Blue embarks on its own low-cost PC clone venture this summer.

So far, Gateway has maintained its entrepreneurial edge by concentrating exclusively on price and service. "We're constantly struggling to keep prices down," says marketing manager Mike Schmith, "but without stinting on quality components or extras like free on-site service." According to IDC's Stephen, this tight-squeeze strategy has enabled Gateway to steal market share from direct-mail competitors such as Swan Technologies and Zeos International Ltd. in the cost-conscious home office market while making inroads against larger vendors like Epson America Inc. and Tandy Corp. with service- and support-minded small-business customers.

Continuing to expand at breakneck speed, however, could prove increasingly difficult for Gateway. One potential source of future growth is the European market. But direct mail overseas involves a complicated and costly web of

marketing and shipping arrangements. Another avenue would be to fill the holes in Gateway's current product line. The company is slated to offer several portable computers this spring.

Gateway also could do more to position its 486 systems as network servers for corporate customers. In fact, the company still has a relatively low profile in the corporate sector. But with business buyers becoming more market savvy, Schmith thinks satisfied Gateway customers could start to order the same budget-priced gear for the office that they've bought for their homes.—Don Marks



For The Black & Decker Corp.'s information systems business, 1991 was a watershed year. The company merged its Planning Research Corp. on the first of the year with another large government systems integrator, Advanced Technology Inc., to become one Black & Decker company—PRC Inc. The parent then installed a new and very aggressive management team made up primarily of former Oracle Corp. executives, headed by PRC president Gary D. Kennedy. At press time, PRC was preparing a public stock offering.

PRC now encompasses all of Black & Decker's information systems business, and analysts say B&D is happy with PRC's performance. Non-IS portions of B&D's business have suffered in the present economy, however, and well-placed analysts say PRC has been restrained from spending enough to support the aggressive growth Kennedy has planned for it. The public offering is expected to ease those restraints somewhat.

The new PRC's revenues for 1991 totaled \$685.2 million. Of that total, PRC designates \$622.8 million as IS revenue. Since at press time PRC was not a publicly held company, no other figures were made available. Analysts say that Kennedy and Bob Laurence, president of PRC Commercial Systems Group, are known for setting high revenue goals but are less aggressive about profitability. The party line both inside and outside the company is that they have achieved revenue goals and are growing as fast or faster than projected. Kennedy declined to comment on profitability because of the pending public offering.

The firm's government-contracting business remains strong despite federal cutbacks in its primary market, defense. PRC has made a strategic shift toward civilian agencies and toward those defense functions spared from the cuts, such as logistics support. At the end of 1991, PRC had a \$1.6 billion contract backlog, a healthy jump from the approximately \$500 million contract backlog at the end of 1990.

PRC also began a strategic push into commercial and international markets in 1991. While observers say the move is both smart and necessary for PRC's future, no immediate results are visible. "It may be too early to tell, or they may be making the mistake of trying to sell commercial accounts with a federal marketing force," says one analyst. "I haven't noticed them adding a lot of new marketing personnel to PRC Commercial Systems."

Overseas, PRC established an Australian subsidiary, PRC International PLC in Sydney, and signed a cooperative-marketing agreement with Digital Equipment Corp. Australia to comarket PRC application solutions with DEC computers. In addition, PRC signed an agreement with British computer company ICL PLC to develop and market image-management systems to businesses in Britain, Europe and the United States.

Imaging and optical storage is one of five "core competencies" that PRC has identified as key to expanded growth in both federal and commercial work. To

NORTH AMERICAN COMPANIES



that end, in 1991 the firm acquired FSA Inc. (now PRC Document Conversion Services). In addition, PRC has initiated pilot projects to develop engineering document management systems for major companies in manufacturing and petroleum.

The other core competencies are open systems integration, telecommunications, technology transfer and software engineering. To support its commitment to open systems, PRC launched a new subsidiary called PRC Openware Inc. Its first products are an object database management system offered through a partnership with its developer, Object Design Inc., and a software conversion product developed by PRC.

The chief challenge facing PRC is to follow through on the aggressive growth paths charted by Kennedy in commercial and international markets. The strategy is healthy, say analysts who contend that

PRC previously suffered from too cautious a management approach. A lot will depend, however, on how successful the public offering is and what resources PRC will be able to apply toward Kennedy's goals. —Leila Davis

IS Revenue **50** \$601.2 Million
NORTH AMERICA

SHL SYSTEMHOUSE INC.
Suite 501
50 O'Connor Street
Ottawa, Ontario, Canada K1P 6L2
(613)-236-1428

Long heralded by analysts as the integrator most likely to succeed at client/server systems development, SHL Systemhouse Inc. has finally

begun to fulfill its promise. After a rocky 1990, which saw the breakup of parent company Kinburn Technology Corp., the transfer of Systemhouse ownership to a coterie of Canadian banks (Kinburn's creditors) and the departure of chief executive officer Roderick Bryden, the firm's pleasantly eventful 1991 must have seemed like a cakewalk.

Systemhouse's past financial woes, it appears, were mostly of Kinburn's making, although recessionary economies in Britain, Canada and the United States didn't help matters. The firm's revenues for fiscal 1991 held steady at a healthy C\$689 million (\$601.2 million), but restructuring charges and reduced profit margins on microcomputer-based systems integration projects soaked the company with a C\$20 million (\$17.5 million) loss. As in 1990, approximately half of Systemhouse's revenue came

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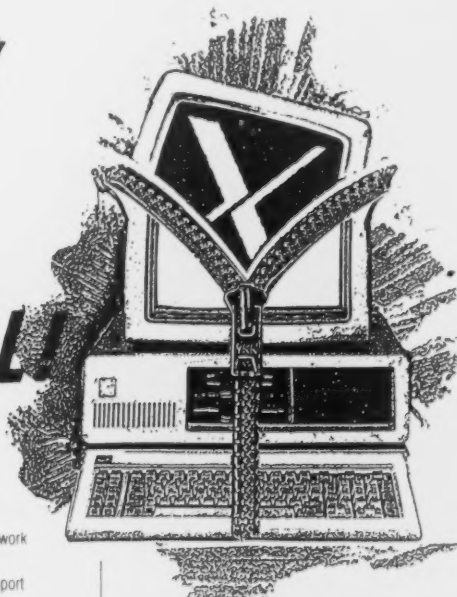
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from systems providers, including ComputerLand Canada and newly acquired Computer-Group PLC U.K., both wholly owned subsidiaries.

Still, last year's losses were far lower than 1990's C\$40 million (\$35 million) deficit. And the company's finances improved steadily throughout 1991, as a new leadership team and revamped marketing strategy began to jell. Much of calendar 1991, in fact, was devoted to implementing a new management structure, refining business goals and refocusing systems integration efforts on workstation- and network-based client/server technology. The last quarter was spent reaping the benefits of the restructuring in the form of two huge outsourcing agreements, together worth over C\$100 million (\$86 million), one with the provincial government of Nova Scotia, the other with Maritime Telegraph And Telephone Co. Ltd.—one of Canada's

largest telecommunications firms.

Systemhouse's new chairman and chief executive, John Oltman, who joined the company in June, hails from systems integrator extraordinaire Andersen Consulting, as do several other top-tier executives at Systemhouse. Industry observer Pete Rosati with International Data Corp. in Framingham, Mass., says Oltman and his colleagues bring "a commitment to total quality management" and "a lot of entrepreneurial energy" to the company.

To maximize its resources, Systemhouse has reorganized its business around four target markets: telecommunications, postal agencies, human services and energy companies. According to Oltman, these sophisticated vertical markets require industry-specific knowledge and technical expertise well suited to Systemhouse's long experience in strategic

client/server systems. This affords Systemhouse the opportunity to pitch its services as more than a way to cut costs by off-loading back-office functions, and to distinguish itself from its larger competitors whose strengths are more in host-based systems. Contracts with Bell Canada, the U.S. Postal Service, the state of California and Petro-Canada—all signed in the second half of 1991—demonstrate the company's strengths in these chosen markets.

Bonnie Digrius, who monitors systems integrators for the Gartner Group Inc. in Stamford, Conn., says Systemhouse can continue to compete effectively against such big guns as Andersen, Electronic Data Systems Corp. and IBM—providing it sticks to its target markets. "If they don't try to be all things to all people," says Digrius, "they'll soon be nipping at the heels of the big guys." —Don Marks

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51 NYNEX \$601.0 M

52 COOPERS & LYBRAND \$571.0 M

53 MARTIN MARIETTA \$561.1 M

54 ERNST & YOUNG \$551.0 M

55 BELL ATLANTIC \$550.0 M

56 D & B SOFTWARE \$548.7 M

57 WORDPERFECT \$532.5 M

58 LOCKHEED \$525.0 M

59 COMPUADD \$513.6 M

60 BORLAND \$501.6 M

61 EVEREX \$492.5 M

62 WYSE \$478.4 M

63 WESTERN DIGITAL \$478.2 M

64 TANDON \$461.4 M

65 STRATUS \$448.6 M

66 SHARED MEDICAL \$438.7 M

67 MENTOR \$400.1 M

68 ASK COMPUTER \$394.6 M

69 KODAK \$390.0 M

70 SYSTEMATICS \$377.0 M

71 3COM \$370.0 M

72 DIEBOLD \$355.0 M

73 CADENCE \$353.0 M

74 MICROPOLIS \$350.9 M

75 POLICY MANAGEMENT \$342.0 M

- LARGE-SCALE SYSTEMS
- MIDRANGE
- PCs
- WORKSTATIONS
- SOFTWARE
- PERIPHERALS
- DATACOM
- SERVICES
- MAINTENANCE
- OTHER

NORTH AMERICAN COMPANIES



THE DATAMATION 100

PROFILES 51-75



51
52

IS Revenue \$601.0 Million

51

NORTH AMERICA

NYNEX CORP.
335 Madison Avenue
New York, NY 10071
(212)-370-7510

For the last two years, NYNEX Corp. has been busy streamlining itself, stripping away businesses not considered part of its core competencies and downsizing its staff by more than 10%. That's the major reason the company's revenues from information systems, software, services and distribution dropped a substantial 33.8% from an estimated \$1.3 billion in 1990 to \$861 million in 1991.

Last June, NYNEX sold its 77 Business Centers to ComputerLand Corp., an action that resulted in a revenue reduction of more than \$400 million. The Business Centers, which grossed \$700 million in 1990, provided about \$260 million to the regional Bell operating company (RBOC) for the first five months of 1991.

"From a strategic point of view [the sale indicates] we are getting away from the hardware and hardware distribution business....Our view is that is not where the margins are," says Paul Cosgrave, new president and chief executive officer of subsidiary AGS Computers Inc., NYNEX's largest software and consulting company.

Fundamentally, this move lets NYNEX focus squarely on the software and services side of the IS business. NYNEX's IS organization is really a number of small and medium-sized acquisitions completed within the last four years. (Within NYNEX regulated wireline services, there are software and integrated systems sales that would be defined as IS revenues. However, because they are so entwined with these communications services, DATAMATION at this time does not attempt to break them out.)

The IS companies include AGS Computers Inc., which itself comprises

eight separate software and services companies. They variously specialize in general computer consulting and systems development; telecommunications and network management software; and applications software for financial services, communications and other vertical markets.

The BIS Group Ltd., AGS's U.K.-based counterpart, is made up of three separate companies. About 60% of its business is financial services software. NYNEX Computer Services Co. specializes in transaction-processing systems and such on-line applications as electronic payment systems for retailing and banking.

Last year, the revenue of these three groups of companies, which DATAMATION considers to account for NYNEX's IS revenue, dropped 2.8% to \$601 million. This was due to a variety of factors. In particular, the recession figured heavily in their chief markets—the bludgeoned Northeast corridor, where many AGS clients reside; the United Kingdom, the BIS bastion; and financial services, which is the primary vertical market for the entire group.

NYNEX says that these pressures were offset by growth in software products sales. "Our greatest strength in 1991 was our ability to move some of our software companies into the international marketplace," Cosgrave says. For instance, AGS's Vista Concepts Inc. captured multimillion-dollar contracts at the Bank of Scotland and Australia Bank.

Outsourcing will also be a critical part of NYNEX's move into vertical markets, particularly in the area of application maintenance. This strategy was given a boost in 1991 when the Modified Final Judgment of the U.S. District Court allowed the (RBOCs) to offer data-processing services.

Finally, NYNEX announced alliances in 1991 to develop multimedia applications for government, hospitals and educational institutions—a harbinger of things to come in corporations where networks, information and information services are core competencies.—*Angeline Pantages*

IS Revenue \$571.0 Million

52

NORTH AMERICA

COOPERS & LYBRAND
1251 Avenue of the Americas
New York, NY 10020
(212)-536-2000

Perhaps the most significant event of 1991 for Coopers & Lybrand was the appointment of Eugene M. Freedman as chairman of the Big Six accounting firm on October 1. One of Freedman's foremost objectives was to reorganize the staff by setting in place new national partners with a renewed emphasis on serving C&L's clients, overall needs.

That's where Ellen Knapp comes in.

The information technology partner for Coopers & Lybrand's Federal Government practice in Washington, D.C., for six years, Knapp was promoted then to the home office as National Director of Information Technology Consulting.

She sees her mission clearly: "To build the Information Technology practice in a way that ensures it plays a real role in responding to clients' business needs and not solely to provide technology solutions to technical problems."

She's building from a base in which worldwide IS revenue grew a modest 6% to \$571 million in 1991. That's up from \$539 million in 1990, the first full year after the merger with Deloitte Touche in the United Kingdom and Benelux countries. C&L says Coopers & Lybrand Deloitte is the largest accounting firm in the United Kingdom.

Strongly committed to industry specialization, Coopers & Lybrand provides management-consulting services to firms in a variety of vertical industry markets, including manufacturing, retail, telecommunications, health care, pharmaceuticals and financial services, as well as the federal government. C&L stresses industry expertise and specialization in its goal of forming



THE DATAMATION 100

PROFILES 51-75



strategic partnerships with its clients. With over 700 offices spanning 117 countries, Coopers & Lybrand has established such relationships with about 4,800 client firms worldwide.

On the technology front, Coopers & Lybrand in the United States boasts an Advanced Technology division which offers several object-oriented products, including a class browser and product enhancer for object-oriented databases.

In the software tools area, C&L has an agreement with Applied Business Technology Corp. to remarket Applied's Project Bridge as SUMMITBridge, an automated presentation and planning facility for Coopers & Lybrand's proprietary methodology.

C&L's worldwide initiative in reengineering has created the Business Process Reengineering's Breakpoint-BPR, a set of multidisciplinary ideas, methods and tools used to change core business processes so as to improve performance. Sparks, a workflow reengineering tool, is one of C&L's software products that support BPR.

Still going strong is a joint venture with IBM called Meritus, a consulting practice for computer-integrated manufacturing (CIM) aimed specifically at the pharmaceutical and consumer products industries.—*Steve Paul*



IS Revenue **\$561.1 Million**

MARTIN MARIETTA CORP.
6801 Rockledge Drive
Bethesda, MD 20817
(301)-897-6000

Overall, Martin Marietta Corp.'s total corporate revenues dropped a hair, by 0.8% to \$6.1 billion. Net earnings were down 4.4% to \$313 million. But revenues from its Electronics, Information & Missiles Group—the division its IS business calls home—

grew 2% to \$561 million. Martin Marietta builds information systems for several military and civil government agencies, including the Air Force, the U.S. Postal Service and the departments of Defense and Housing and Urban Development.

The IS business was folded into the Orlando, Fla.-based electronics and missiles group in 1991. And, since the IS division now shares a balance sheet with Martin Marietta's military hardware operation, the IS division truly had a bang-up year—compared to the rest of the company. The military hardware operation fattened upon Strategic Defense Initiative (SDI) contracts and Patriot missiles, for which it is a prime contractor.

One of the nonmilitary reasons for the division's prosperity came from a new contract with the U.S. Postal Service signed last year. Martin Marietta will rebuild more than 500 machines that process large, flat pieces of mail, such as magazines and oversized envelopes. The company is also building 812 bar-code readers to process postal bar codes on that same large, flat mail, as well as new computerized label printer/applifiers.

The company completed the first full year of work on a new nationwide information system for the Department of Housing and Urban Development in 1991. Most of the work involved tying existing workstations into a new mainframe-based system.

Facilities management contracts continued to pour cash into Martin Marietta's IS coffers last year. The company provides support services for software applications at the Social Security Administration's Baltimore data-processing center. The applications are used to issue Social Security cards, maintain earnings records and process benefit claims, handling more than 4.5 million transactions a day. Martin Marietta also handles data center management for Orange County, Calif.

And then there are the military contracts. If there was any worry about the peace dividend cutting into Martin

Marietta's defense business in 1990, it certainly evaporated in 1991. The company began production of new test equipment for the Navy and the Air Force last year, as well as continuing work on SDI supercomputer-based battle simulations. Later this year, Martin Marietta will bid on a contract to develop a workstation-based battle simulator for the Army.—*Mike Ricciuti*



IS Revenue **\$551.0 Million**

ERNST & YOUNG
787 Seventh Avenue
New York, NY 10019
(212)-773-3000

Ernst & Young is one of the several Big Six accounting firms that have begun to get very healthy returns on their information technology consulting practices in recent years.

Examples of Ernst & Young's IT Systems Planning and Delivery services include custom and package systems development, redevelopment engineering, systems integration, outsourcing and the Ernst & Young Navigator Series of development methodologies, which complies with IBM's AD/Cycle application development framework.

Last year, E&Y's IS consulting revenues grew by a very respectable 12.4% to \$551 million. Total revenue for the firm reached \$5.4 billion, an increase of 8%.

The growth came in great part from a strong increase in demand from large corporations struggling to make big changes in the way they use information technology. To help the firm better serve this growing demand, Ernst & Young last year merged computer-aided software engineering guru Vaughan Merlyn's CASE Research Inc. and brought Merlyn and his partner Greg Boone into E&Y's Boston Center for Information Technology and Strategy.



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PROFILES 51-75



55
56

The Boston center also completed contracts for two major IT research studies last year, one on banking technology and the other on "Information Management and Japanese Success." The Center for Information Technology and Strategy is one of E&Y's two IS operations, the other being its Center for IT Planning and Delivery in Dallas.

Merlyn and company have been hard at work since early last year establishing a completely new practice for E&Y: Development Effectiveness. The program is aimed at helping companies improve their software development processes and lay the foundation for implementing advanced development technologies such as CASE, Total Quality Management and object-oriented programming and database management systems. Components of the new E&Y practice include Organizational Change Management, Continuous Quality Improvement and Process Innovation. During 1991, three U.K.-based companies and five U.S. corporations used E&Y's Development Effectiveness services.

The company also signed an agreement last year with Dun & Bradstreet Software Services Inc., which designated E&Y as one of three Big Six preferred installers selected for their financial, human resources and materials management software systems.

—J. William Semich

IS Revenue

55

\$550.0 Million

NORTH AMERICA

BELL ATLANTIC CORP.
 1600 Market Street
 Philadelphia, PA 19103
 (215)-963-6000

Like most regional Bell operating companies, Bell Atlantic Corp. had a generally lackluster year due to the recession. Revenue declined a slight 0.15% to \$12.28 billion, and the company took a mega loss of \$222.7 million due to a one-time write-off of \$1.55 bil-

lion to adopt a new accounting standard on health and life insurance benefits for retirees. That put them one step ahead of other large corporations, all of which have to comply by January 1, 1993. Still, even without the write-off, earnings would have declined 2.7%.

All that made the performance of Bell Atlantic's information systems and services subsidiary, Business Systems, shine a little brighter in comparison. According to Julie Dobson, vice president of planning and development, Business Systems reported an almost 15% gain in revenue over 1990's level. DATAMATION estimates that to be a rise from \$480 million to \$550 million.

Business Systems represents only the IS revenues from the nonregulated side of the business. Under the regulated Network Services side, there are sales of telecommunications software and integrated systems that would be defined as IS revenues. However, because they are so entwined with Bell Atlantic's communications services, DATAMATION at this time does not attempt to break them out.

The majority of Business Systems's revenue and growth was generated by the maintenance and support firm, Bell Atlantic Business Systems Services Inc., which was created in 1990 from the acquisition of Sorbus Inc. and Control Data Corp.'s third-party support activities.

In 1991, big IBM shops were the major target of Business Systems Services (BSS). According to Dobson, this operation achieved triple-digit revenue growth through contracts to maintain and support mainframe systems. "We are now supporting more than 200 IBM 3090s," she says.

BSS is apparently using the partnership strategy to storm IBM-dominated bastions. Last year, it inked separate agreements with Amdahl Corp. and NCR Corp. to provide single-source, multivendor services. In Europe, Bell Atlantic and ICL PLC have created a joint venture to offer maintenance services to multivendor

sites. BA's European maintenance business has grown 30% annually in recent years (reaching about \$200 million), and the alliance should provide it with a stronger presence there.

Another reason for BSS's growth in mainframe maintenance contracts, according to Dobson, are new account management and diagnostic tools for systems support, announced in 1991. One is the PC-based Service Edge system. It features a predictive service for diagnosing and alerting field-engineering staff of problems in IBM-compatible systems. It also sports an integrated database on service activity, as well as parts and machine inventories. Also announced was the Remote PSR service, which provides software information and problem management for large IBM systems.

Among major new Bell Atlantic alliances to watch this year is one with Electronic Data Systems Corp. to develop applications systems for the wireless industry. Another is with the Italian telecommunications holding company STET to develop software to improve the quality of telephone and wireless services. And a third is with Apple Computer Inc. and CHI Consulting to integrate Apple products with IBM environments.

—Angeline Pantages

IS Revenue

56

\$548.7 Million

NORTH AMERICA

**DUN & BRADSTREET
SOFTWARE SERVICES INC.**
 3445 Peachtree Road, Northeast
 Atlanta, GA 30326
 (404)-239-4636

Although Dun & Bradstreet Software Services Inc. had been making a cushy living off large, mainframe-based software applications, chairman John Imlay saw the handwriting on the wall late in 1990. And that handwriting spelled c-l-i-e-n-t/s-e-r-v-e-r.

The result? In 1991, the software

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and services unit of financial services giant Dun & Bradstreet Corp. made a serious effort to develop svelte client/server versions of its human resources, financial and manufacturing software. "IBM mainframe growth was not great last year," says Imlay. "We had planned to bring out our first client/server products in 1993, but we accelerated development to get products out a year earlier."

Spending on development of those new products, combined with a slow economy and restructuring charges carried over from the 1990 merger of Management Science America Inc. and McCormack & Dodge Corp., which created D&B Software, dragged the company's operating income down more than 12% to \$36 million. Revenue rose a paper-thin 1.8% to nearly \$549 million.

To develop new applications quickly, D&B Software looked for experienced client/server help from the likes of Cognos Corp., Powersoft Corp. and Sybase Inc. The hope was to retain downsizing customers who may be considering venturing out of the fold.

Those first client/server products ship this month, and Imlay is looking to make back some of the money spent to build them. But D&B Software isn't putting all of its fiscal eggs into one client/server product basket. "We see our consulting services business and our international sales growing at a rapid pace, both for mainframe and client/server systems," says Imlay.

Despite the departure last November of executive vice president and chief technology officer John Landry, who codeveloped the WiJit technology on which the new client/server products are based, Imlay says future product plans are firmly on track. John Pepe, senior vice president of customer support and engineering, is taking up where Landry left off, says Imlay, in determining new product strategy.

Also, D&B Software quickly put the other WiJit developer, Massachusetts Institute of Technology professor Thomas Malone, on retainer to help

the company build future products.

No doubt the slow economy, lagging mainframe sales and shifting customer base in 1991 have changed D&B Software forever. Imlay says that more client/server products will roll out over the next few years, eventually taking D&B Software completely away from its mainframe roots. "We will continue to support our mainframe products," he says, "but we will eventually replace them all with client/server products."

—Mike Ricciuti

IS Revenue 57 \$532.5 Million

NORTH AMERICA

WORDPERFECT CORP.

1555 North Technology Way
Orem, UT 84057
(801)-225-5000

WordPerfect Corp. president and founder Alan Ashton says his company now concentrates on "word processing and communications"—primarily WordPerfect and the electronic mail and office automation package, WordPerfect Office.

Unlike rival Microsoft Corp., which makes many products for a few environments, WordPerfect Corp. makes fewer products for many environments. WordPerfect now runs on 15 platforms and has been translated into 17 languages. Sales outside the United States accounted for 40% of revenues, generated through 45 offices and distributors serving 90 different countries. WordPerfect Office runs on PCs and Macintoshes. And to enhance communications, the company also produces various gateways, print servers and translators.

At first blush, it would appear that this approach has panned out. In 1991 WordPerfect increased its staff by almost 22%, adding 520 employees to reach 2,896 worldwide. And total revenue rose 17.7% to \$532.5 million. That

growth, however fell short of the company's own prediction that it would grow 33% to top the \$600 million mark in 1991 and was far behind 1990's 60.7% revenue spurt.

One factor behind the shortfall in expectations may be that WordPerfect did not anticipate the rapidity with which demand for Windows applications would supplant demand for plain DOS applications. The company has been admittedly tardy in implementing a Windows strategy. WordPerfect for Windows, introduced last year, produced \$53 million in revenue by year's end. WordPerfect For DOS, however, still contributed the lion's share of revenues, some \$307 million for the year.

The company introduced nine other new products and upgrades in 1991, including versions of WordPerfect for Macintosh, NeXT and VAX operating systems. An AS/400 version came out this spring, and one for Go Corp.'s PenPoint operating system is promised this month.

Privately owned WordPerfect has always kept its inner workings to itself. And why not? It has never had to sell stock or borrow money in 13 years of operation. However, a management shakeup in March of this year—possibly the first in its history—opened the door a bit. Pete Peterson, executive vice president, exited the company, and the board of directors was both expanded and removed from day-to-day management.

"In the past, there was quite a bit of reluctance to go out and give technical help and assistance to corporations," Ashton admits. "We want to be more responsive to large customers, especially ones with cross-platform and messaging/mail needs."

Moreover, "in the past, we have not been as willing to work with other companies and make alliances," Ashton adds. An example of the new attitude is its WordPerfect Works communications module, OEMed from Magic Soft.

For the future, Ashton intends to

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offer more products sporting graphical user interfaces. A UNIX version of WordPerfect running under the Motif GUI is in beta, a native mode version of WordPerfect For OS/2 is in the works and even a GUI DOS version is planned. Ashton promises to keep implementing the latest capabilities in DOS versions of WordPerfect's products. And "watch for us at fall COMDEX," he says. "Some exciting things will be happening."—*Lee Thé*

IS Revenue **\$525.0 Million**

58

LOCKHEED CORP.
4500 Park Granada Boulevard
Calabasas, CA 91399
(818)-876-2000

Lockheed Corp.'s IS business is CalComp, the Anaheim, Calif., maker of computer graphics peripherals, including plotters, color printers and digitizers. During 1991, CalComp introduced nine new products in all areas and acquired a U.S. computer graphics distributor to improve its competitive fortunes. The result was 25% revenue growth during 1991 to \$525 million.

As the company had hoped, CalComp's array of new offerings brought its product lines closer to the demands of the marketplace. Fully half of CalComp sales during 1991 came from new products. To provide more effective access to its markets, CalComp acquired Access Graphics Technology Inc., a distributor of computer graphics peripherals and workstations.

During the year, CalComp formed its Team 90 program, a cross-functional group including engineering, finance, manufacturing, product assurance and supplier operations, all bent on shortening the product development cycle. CalComp also launched programs to improve customer service

and manufacturing efficiency. In addition, the company established subsidiaries in Austria, Australia, China and Taiwan. Finally, CalComp's Hudson, N.H.-based operation ceased its efforts in the display market. The Display Product Group was renamed the Electronics Manufacturing Group at the start of 1992 and will sell manufacturing and design services.

Overall, Lockheed Corp. revenue dipped 1.6% to \$9.8 billion, as net earnings fell 8% to \$308 million. And, while one would expect defense cutbacks to be the culprit, at least part of the problem, according to Lockheed officials, was an increase in Lockheed's effective tax rate to 35% from 22%.

Lockheed's IS business is a result of commercial expansion during the early 1980s, when the defense business was going strong. Much of this expansion was sold off in the late 1980s to get corporate finances under control. But, as soon as the housecleaning looked complete, the once high-flying defense side of the business took a nosedive as Eastern Europe changed the course of history. CalComp is now not only Lockheed's sole IS property but an important hedge against the corporation's less predictable defense and aerospace properties.—*Bill Sharp*

IS Revenue **\$513.6 Million**

59

COMPUADD COMPUTER CORP.
12303 Technology Boulevard
Austin, TX 78727
(512)-250-1489

CompuAdd Computer Corp. hit the ground running in 1991, completing a rush Defense Department order for some \$30 million worth of computers for Operation Desert Shield. Despite a relatively short lead time and only 30% of the parts in inventory needed for the order, CompuAdd delivered the equipment on time.

The government didn't forget. In

November, it awarded its friend in need the Desktop IV contract, an estimated \$398 million PC deal. However, that contract is currently tied up by a protest from other companies that had also bid on the project. If the PC clone maker had had the contract in hand, its sales would likely have hit close to the \$1 billion mark for the year.

Sans the contract, the privately held CompuAdd still did well, garnering revenue of \$513.6 million. Unlike in previous years, that figure doesn't include revenue from CompuAdd Express, a company spun off last year to handle mail order sales, so year-to-year revenue comparisons are irrelevant.

The number of the company's retail operations grew in 1991, jumping from 88 locations in 1990 to 120 by the end of the year. CompuAdd's retail division has sold only CompuAdd computers and selected peripherals in the past, but this year it will begin selling Apple Computer Inc.'s Macintosh line, making CompuAdd one of Apple's largest resellers.

And early this year, CompuAdd again rubbed salt in the wounds of the big boys in the computer industry when it beat out IBM and NCR Corp. for a \$53 million cash register contract from Sears, Roebuck and Co. CompuAdd wowed Sears by demonstrating working prototypes of its point-of-sale terminal within days of sending out the proposal. The 28,000 terminals are based on Intel Corp.'s 16-megahertz 386SX microprocessor.

Unlike many of its clone competitors, CompuAdd derives 90% of its revenues from domestic sources. That may change this year, as CompuAdd chairman and chief executive officer Bill Hayden, after having spun off CompuAdd Express last year, again divided the CompuAdd corporation into several smaller operating units in 1992.

Hayden, a devotee of the Smaller-Is-Better school of management, has divided the company into two autonomous divisions, one to handle the company's retail stores and inter-



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national markets, and the other to focus on large business and government accounts. Managing these tightly focused units will be two new executives. James H. Moore from Texas Instruments Inc. will handle the Retail/International Division, while John L. Conn, formerly of Harris Corp., is general manager of the Systems and Technology Division.

In addition, the company spun off CompuAdd Information Systems as an independent entity in March of 1992. Intended to do custom programming for large firms, the spinoff's first customer is Sears. It's providing programming for the retailer's brand-new POS terminals.

CompuAdd's success with large orders should not be a big surprise. The company's PCs have always done well in most reviews. And the firm got another feather in its cap last year when San Jose-based Dataquest Inc. ranked CompuAdd first among PC manufacturers in its user satisfaction survey.—*Bob Francis*



In the depths of the ocean lives an amazing creature called the gulper eel, which can swallow fish as big as itself. PC software vendor Borland International Inc. followed this example last fall by gobbling up database software vendor Ashton-Tate Corp. Borland immediately doubled in revenue to \$501.6 million, catapulting Borland onto the North American DATAMATION 100 for the first time.

The downside of this bold move was a \$116 million acquisition cost during 1991, resulting in an \$80.7 million net loss for that year. The company also

had to integrate the nearly half of Ashton-Tate's 1,600-person staff that was kept on. That brought total employees to 1,950 by year's end.

"We didn't add anybody from Ashton-Tate's executive suite," pointedly remarks Philippe Kahn, Borland's president and chief executive officer. Borland's top management roster has been stable for years.

Ashton-Tate has a longstanding lawsuit in which it has been vigorously defending its dBase product against Fox Software Inc., maker of FoxBASE. Borland, too, has a dBase product, which complements Borland's Paradox database products. Of course, the best protection from a litigious company is to buy it, but Kahn says that in acquiring Ashton-Tate, primarily "we bought distribution channels for our upcoming technologies"—especially internationally, whence 50% of Borland's revenue now comes.

In any case, Borland wasn't just buying products when it bought Ashton-Tate. Not only has Borland been developing its own dBase product for years, but research and development expenditures remained a healthy 12% of revenue, totaling \$61 million in 1991.

Calculated risk-taking has characterized Borland since Kahn founded it in 1983. Its first product, the Turbo Pascal programming language, pitted the start-up against Microsoft Corp. and other established vendors.

Another core value has been the fact that, like Microsoft, Borland produces applications with its own development tools. To this Kahn adds a fillip even Microsoft can't equal: "In 1989, we decided to start all our new generations of products from scratch in Borland C++"—the company's premier object-oriented programming language. "Lotus and WordPerfect did quick ports [to Windows], and aren't doing so well. It took us more time. But when we ship, it'll be great. Updates will happen more quickly, too."

Those new generations of windows applications created with object-oriented code include the Quattro Pro

For Windows spreadsheet and Paradox For Windows relational database (along with a revised DOS version) due this summer. Those are slated to be followed by dBase For Windows later this year. Borland will also be producing OS/2 products, as well as continuing to update its DOS software.

In the long run, the biggest impact of the Ashton-Tate acquisition may turn out to be the Interbase family of scalable database engines, including a multiplatform server, which competes to some extent with Microsoft SQL Server. Borland has moved most of the Interbase development team from Boston to its Scotts Valley, Calif., headquarters.

Borland is using the Interbase products to strengthen its database backend capabilities, to provide for a high level of interoperability between Borland (and others') applications and development tools, and to make a place for Borland's products in multivendor UNIX and VAX networks in UNIX and VAX environments.—*Lee Thé*



Everex Systems Inc. rose from the dust of three money-losing quarters in 1991 to regain profitability in the fourth quarter. In early 1991, chairman/founder Steve Hui recruited president Harold Clark from giant distributor Ingram Micro Inc. Clark immediately set forth to control costs while at the same time rebuild Everex's personnel, product and distribution structure. Meanwhile, Hui dived into the labs to create personal computer products bristling with patentable innovations.



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Both succeeded, and in the process refocused Everex from a domestic PC systems maker with industrial-strength products for value-added resellers to one much more dedicated to retail sales and the international market.

One quarter of profitability was not enough to pull Everex into the black for the year; the company ended 1991 with \$31.4 million in red ink, building on its \$800,000 loss the previous year. But revenue rose 15.2% to \$492.5 million, a considerable improvement over the previous year's 6.4% gain.

Clark did some cherry picking from among the many companies he'd worked with while at Ingram and brought in some key marketing and financial executives. The team's cost control measures reduced engineering costs from 10% of sales to around 4%, mainly by removing duplicated staff functions, eliminating a number of peripherals product lines and simplifying each product line.

At the same time, distribution underwent a Big Bang—out from Everex's traditional base of value-added resellers into major retail chains at home and abroad, both high-end and mass market (the latter with the new low-cost MaxLogic PCs). International sales doubled—to 20%—by increasing distribution into established markets and by expanding into new territories. Everex's thrust into the retail channel became even more evident last month, when the company announced that it had agreed to acquire mail-order PC supplier Northgate Computer Systems Inc.

By the spring of 1992, Hui's group had produced several new lines of technologically impressive, internally developed servers and notebook PCs. For example, the Carrier line of notebooks features removable hard disks and batteries.

Due this summer is perhaps the world's first Intel-based multiprocessing server with a patented fault-tolerant design that lets it run any box-stock PC operating system, including

MS-DOS, NetWare and UNIX.

Another patented result of Everex's \$28.8 million research and development budget is a tape backup due this month that is, as Clark puts it, "about three times as fast as anything on the market for one-third to one-half the cost." Coming up, he adds, are "pen-based multimedia PCs with accelerated graphics, [and] comarketing projects in important niche areas." As Hui puts it: "Our aim is to develop products that run industry standard software in innovative ways." —*Lee Thé*

IS Revenue \$478.4 Million

62

NORTH AMERICA

WYSE TECHNOLOGY INC.
3471 North First Street
San Jose, CA 95134
(408)-473-1200

Wyse Technology Inc. spent 1991 further distancing itself from the clone image that nearly did it in two years ago.

After a group of Taiwanese investors called Channel International Corp. rescued it from huge losses in 1990, the now-private Wyse says it has been profitable for most subsequent quarters. It's climbed back into the black by concentrating on three core businesses—terminals, PCs and a new line of multiprocessor servers—and by continuing to build relationships with key value-added resellers and original equipment manufacturers.

That strategy produced revenue growth of 4% to \$478.4 million, according to DATAMATION estimates.

Accounting for between 50 and 60% of sales, Wyse's terminal business grew last year with the addition of several new models. In October, Wyse launched a new line of low-emission models designed to conform to tough Swedish guidelines. The company also rolled out a color terminal for under \$1,000 and a family of X terminals that

met with favorable reviews. According to a study done by the Framingham, Mass., market research house International Data Corp., Wyse is the largest independent supplier of terminals worldwide and has an installed base of 3 million.

The success in PCs at closely held Wyse is harder to measure. There was no shortage of new product announcements: the company launched a full range of 386- and 486-based Decision desktop models, in addition to a number of notebooks. But Wyse may have lost some market share as it worked at getting costs under control. "In the PC area, we did see some decline in business, but our margin has been improving somewhat," says Daniel Wu, company president.

By getting high-performance products to market faster and by controlling costs, Wyse hopes to regain its former strength in PCs. Wu points to the recent launch of one of the first systems based on Advanced Micro Devices Inc.'s new 40-megahertz chip as proof that his company can move quickly to get products out the door.

The real future of Wyse probably lies more in its developing line of multiprocessor servers, introduced in 1990. The family now spans the entry-level series 5000i, the middle-range 7000i and the high-end series 9000i, which can include up to eight 486 processors and support as many as 250 users. "In advanced systems, we are talking about continuous high growth in the triple digits," says Wu, who attributes this success to the company's focus on lower-priced systems relative to competitors, such as Compaq Computer Corp. or NCR Corp. "In the current economic situation, the higher end gets hurt more than the medium end," he says.

The company's focus on systems software in the inherently complex world of UNIX may also be helping keep margins up. A member of UNIX International Inc. and the MP UNIX Consortium, Wyse was able to become one of the first companies to ship systems last year based on the new multi-



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processor implementation of UNIX System Laboratories Inc.'s UNIX System V release 4. Similarly, Wyse is now working with Microsoft Corp. to fine-tune the multiprocessing capabilities of the upcoming Windows NT operating system.—*Paul Pinella*



IS Revenue **\$478.2 Million**

63

WESTERN DIGITAL CORP.
8105 Irvine Center Drive
Irvine, CA 92718
(714)-932-5000

Last year was a year of decision for Western Digital Corp. Shaken by intense price competition and declining profit margins in the desktop storage market, this almost billion-dollar manufacturer of disk drives, board-level products and semiconductors found itself forced to make dramatic changes to both its marketing strategy and its product offerings. Judging from the company's performance so far in 1992, it appears to be an organization that works well under pressure.

The most important change Western Digital made in 1991 was to streamline its volatile value-added reseller channels and concentrate instead on developing stable, long-term relationships with original equipment manufacturers and strategic partners. Although the company has no plans to abandon its current VARs, the new thinking is that only computer manufacturers can provide the secure, high-volume agreements needed to stabilize the company's cyclical and cash-hungry PC storage business. Disk drive sales currently generate approximately two-thirds of Western Digital's annual IS revenue of \$478.2 million, a 3.9% increase from 1990's level.

In the storage controller, systems logic and video-imaging markets, which together constitute the remain-

ing third of the company's IS business, an industrywide shift to tightly integrated, small-footprint desktop systems and portable computers severely dampened demand for Western Digital's board-level products. Worse, the firm's capital-intensive transition to manufacturing those components as chips, rather than boards, which began in 1990, hasn't restored these businesses to their previous volume levels. In October, a need for cash precipitated the sale of the company's local area network adapter card products to Standard Microsystems Corp., taking Western Digital out of the networking business entirely—at least for the time being.

Needless to say, all of these changes took their toll on the corporate balance sheet. After breaking the billion-dollar barrier in 1990, Western Digital's revenue for 1991 slid back to \$916 million, a decline of 14% from the previous year. The company also took a pretax restructuring charge of \$81.5 million—attributable primarily to staff reductions and write-downs of older technologies—and ended the year with a whopping \$95.5 million loss.

Perhaps the most significant financial achievement of 1991 was the successful restructuring of the company's hefty \$206 million worth of debt. According to Alexa McCloughan, a storage industry analyst with International Data Corp. in Framingham, Mass., debt restructuring bought Western Digital time to put its new OEM-focused strategy to work. Says Bob Blair, Western Digital's vice president of corporate communications, 76% of the company's fiscal 1991 revenue came from OEMs, and the percentage continues to rise.

"Over the last 12 to 18 months," Blair says, "we've significantly increased the amount of OEM business we do with large market-share PC vendors such as IBM, Gateway 2000, Tandy, Olivetti and others." IDC's McCloughan believes that Western Digital could soon announce strategic partnerships with a few major PC manufacturers, involving both its

drives and chips, perhaps within the next six months.

Western Digital's core products apparently haven't suffered any permanent damage from the firm's fiscal woes either. According to McCloughan, the company's Caviar and Piranha series of medium-capacity (80, 100 and 200 megabytes) 3.5-inch drives have been selling vigorously throughout the first half of 1992. "The market for mainstream disk drive products has really picked up in the last six months," says McCloughan, "and suddenly Western Digital has an incredible product in a very hot market."

Western Digital's Blair agrees. "Some of the fundamentals in the storage market have improved notably," he says. "The double-digit, month-to-month price erosion we saw in 1991 has slowed, and our margins have improved." Both Blair and McCloughan speculate that—barring anything unforeseen—Western Digital could return to profitability as early as mid-1992.—*Don Marks*



IS Revenue **\$461.4 Million**

64

TANDON CORP.
301 Science Drive
Moorpark, CA 93021
(805)-523-0340

Tandon Corp.'s drive into the crowded U.S. PC market was a success last year from a sales standpoint, but those sales did not translate into profits.

In 1991, Tandon's revenue rose 4.9% to \$461.4 million. But, after last year's brief visit to the land of black ink, the company was back in the red, with an operating loss of \$8 million. Restructuring and inventory revaluation added about \$40 million on top of that, leading to a net loss of \$48 million.

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Despite the free-flowing red ink, Tandon made some big strides in the U.S. market last year, garnering 21% of the company's total sales in the United States, up from 7% in 1990. Europe remains the company's primary market, however, where it still does 77% of its business, and it's facing increasing competition there from the likes of Commodore International Ltd., Compaq Computer Corp., Dell Computer Corp. and IBM.

But there's little doubt of the company's dedication to the U.S. PC market. Last year, the company snapped up two PC manufacturers, PC Brand Inc. in the second quarter and Positive Corp. in the third quarter. PC Brand is Tandon's ticket into the fast-growing mail order PC market, whereas Positive gives Tandon even more access to the retail channel. Positive sells its PCs through warehouse clubs, such as Kmart Corp.'s PACE Membership Warehouse Inc., The Price Co.'s Price Club warehouses and Sam's Club Division of Wal-Mart Stores Inc. Tandon's own line of PC products are sold primarily through dealers, value-added resellers and the company's field sales force. The heads of Tandon's various PC lines all report to Ranjit Sitlani, executive vice president of Tandon.

Tandon's major new products last year included the introduction of a modular line of PCs called Option, aimed squarely at corporate IS purchasers. The Option line allows users to upgrade the central-processing unit and memory by replacing a cartridge in the front panel of the PC. In addition to the Option, Tandon introduced the PacII computer, which features an interchangeable portable hard drive. The PacII is aimed at users concerned about data system portability, security and drive capacity. The company also entered the fast-growing notebook PC market with the 20-megabyte Tandon NB/386sx. A version with more memory was introduced later in the year. —Bob Francis



IS Revenue \$448.6 Million

STRATUS COMPUTER INC.
55 Fairbanks Boulevard
Marlborough, MA 01752
(508)-460-2000

Every time AT&T exhorts customers to "reach out and touch someone," Stratus Computer Inc. executives smile. In 1991, telecommunications firms provided much of the impetus for Stratus's revenue gains, which rose a solid 11.1% to \$448.6 million. As telecommunications firms continue to expand the services they offer, they require more and more fault-tolerant computing power. Stratus grew its budding telecom business 70% last year, and it now represents about 21% of Stratus's revenue, says Gary Haroian, corporate vice president and general manager of corporate operations. No wonder that Stratus will continue to focus its strategy on worldwide telecom customers.

Those telecom customers demand UNIX-based systems, and that generally means an equivalent demand for reduced instruction set computing platforms. Last year, the company shipped the first models of a new line of RISC-based computers, called XA/R, which were announced in 1990. Stratus is expected to introduce multi-processor models this year, but it won't have a full XA/R line until 1993. By then, however, the company plans to replace its entire proprietary XA/2000 complex instruction set computing line with the reduced instruction set computing machines. Revenue growth, which slowed from 1990's 18.3%, reflected this product transition.

A comprehensive XA/R line should provide some steam for Stratus's many original equipment manufacturer, value-added reseller and distributor partnerships, including its OEM deals with LMEricsson Telephone Co. and NEC Corp., both of which have contracted to sell only RISC systems.

Although Stratus forged these partnerships in 1990 and has high hopes for them, the company has realized virtually no revenue from either of them to date, due in part to the XA/R ramp up.

IBM, Stratus's largest OEM, continues to disappoint, accounting for 18% of sales, down from 23% last year. Haroian admits that reselling Stratus systems (under the IBM System/88 banner) is "not a priority" for Big Blue. Despite rumors to the contrary, Stratus intends to stick with the relationship, but forecasts that IBM will continue to provide it with flat or declining revenues. However, analyst Steve Weber, managing director of Cowen & Co. in Boston, raises the question of whether IBM may replace the System 88 with a fault-tolerant system of its own.

Apart from that question, Stratus is well set for the future. In an effort to boost profits, which in 1990 were up only 4.5% over 1989's level, the company in 1991 reduced its cost structure—and, unlike most Massachusetts systems vendors, it did so without reducing its work force. The company implemented a reorganization, announced in late 1990, in which it delegated profit and loss responsibility to autonomous international, telecommunications and domestic sales divisions. A remarkable 34.3% earnings hike resulted, bringing profits to \$49.7 million. Along with telecom, the international division was largely responsible for this improved performance. It garnered sizable sales to banks, such as France's Credit Lyonnais. Haroian notes as well that Stratus systems now run in almost every major airline in the world.

Haroian cautions, however, that while revenue growth is indicative of future performance, such a jump in earnings is an anomaly resulting from 1991's stringent expense controls. He forecasts more subdued earnings growth in the future.

—Elaine L. Appleton



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IS Revenue **\$438.7 Million**

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NORTH AMERICA

SHARED MEDICAL SYSTEMS CORP.
51 Valley Stream Parkway
Malvern, PA 19355
(215)-296-6300

Last year, Shared Medical Systems Corp. continued a turnaround that began late in 1989 with the announcement of totally revamped hospital information systems for IBM and Digital Equipment Corp. users. Total IS revenues increased 8.8% to \$438.7 million, building on the previous year's 3.4% rise. The results from service and system fees (exclusive of the hardware sold when SMS provides an integrated system) are slightly better, up 9.4% to \$390.6 million. And net earnings rose a healthy 11.5% to \$25.3 million, a welcome change from 1990, when earnings dipped slightly.

According to Stephen McClellan, Merrill Lynch & Co. Inc. first vice president and veteran software and services analyst, the turnaround is a result of more than the new products and services. "There have been management and sales force reorganization, and the hospital scene is more sanguine than normal. Hospitals are willing to spend more money on capital projects. For five years, they were just trying to survive, and now they are playing catch-up...The prospects have not been this good in the last eight years."

The premier SMS system is the IBM mainframe-based Invision, which is offered either for in-house use or as a remote-computing service. Since 1989, more than 80 new hospitals have signed up, including 35 in 1991; another 190 customers have upgraded from the previous system, Independence. A particularly positive development with Invision is a return to a trend reminiscent of the 1970s: more hospitals (80% of new clients) are opting for remote data processing, linking to SMS's data

centers rather than employing an on-site installation. This, says McClellan, means more recurring revenues and profits for Shared Medical.

That arrangement is also better for the customer, says SMS vice president of administration Michael Costello. "Financially, remote computing has always been the more attractive option, but emotionally, hospitals, which have a large capital investment in the data center and staff, have had a difficult time letting go. Also, shared systems fell into disfavor in the mid-'80s, when personal computers proliferated in health care."

In addition to the Invision gains, Costello says, several units had a strong year, particularly the professional services and international divisions. While the firm has operated abroad for 10 years, international sales went into high gear in 1991, increasing 40% to \$53 million.

Among other key events of last year, perhaps the most far-reaching is the new SMS strategic alliance program. Six hospitals signed up for the program in 1991, committing capital investment funds into the program for new applications development. Many applications will focus on hospital records automation, where, McClellan says, SMS is aiming to be the leader within the next two or three years.

Two key technologies for the on-line medical record business are document imaging and diagnostic imaging. SMS already has a document-processing system in the prototype stage. A few years away is the more complex on-line diagnostic imaging, which demands high-quality computerized axial tomography (CAT-scan), magnetic resonance imaging (MRI) and other images that a radiologist can rely upon.

Focusing on larger customers and contracts, Shared Medical also trimmed away two businesses in 1991: its Canadian subsidiary and the physicians practice management business, a processing service. However, the firm continues to offer the turnkey Signature system for physicians.

—Angeline Pantages

IS Revenue **\$400.1 Million**

67

NORTH AMERICA

MENTOR GRAPHICS CORP.
8005 Southwest Boeckman Road
Wilsonville, OR 97070
(503)-685-7000

Mentor Graphics Corp. was more than a day late and a dollar short last year. The supplier of electronic design automation software entered 1991 already 12 months behind the original delivery schedule of release 8.0 of its Falcon Framework For Concurrent Design software. Mentor met with weakened market demand for computer-aided engineering software of all kinds. Consequently, the company ended the year with an 8.1% drop in revenue to \$400.1 million and a \$61.6 million loss, compared with 1990's \$23.6 million profit.

Despite the grim financial report, many analysts remain bullish on the company, convinced that the bad news at Mentor is history. For starters, Mentor was able to begin a phased shipment of release 8.0 for certain platforms, including Sun workstations, which began to ship last summer.

Realizing that it had spread its resources too thin, the company bit the bullet in the third quarter and bailed out of developing the computer-aided software engineering (CASE), mechanical design and documentation products that fit into the Falcon Framework. Although 35% of its revenue came from bundling its software with third-party workstations last year, Mentor is also moving out of the original equipment manufacturer hardware market.

Mentor refocused on integrated circuit design and concurrent engineering, leaving CASE and other secondary markets to a growing number of third-party suppliers, whose software works with Mentor's under the company's OpenDoor Partner program.



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The shift took its toll, however. Mentor reduced its work force by 15% and took a \$27 million, third-quarter write-off for restructuring. But for the fourth quarter, Mentor rebounded slightly and reported a slim profit.

Even during a year that the company would rather forget, there were bright spots, including a solid market reception of the IC products Mentor acquired two years ago when it bought Silicon Compiler Systems. "Strategically, [the acquisition] was absolutely one of the best things we've done," says Thomas H. Bruggere, chairman and chief executive officer.

Approximately 52% of Mentor's 1991 revenue came from outside the United States, and its international business looks solid. The company's business in Japan increased substantially last year, positioning it to capitalize on Japan's consumer electronics industry, now beginning to make more use of IC software. "A significant part of the computer industry is happening [in Japan]," says Bruggere, who expects fast growth after the current downturn in the Japanese economy. And, in Europe, Mentor scored a coup last fall when it signed a nonexclusive marketing pact with Siemens-Nixdorf Informations systeme AG, beating out competitor Cadence Design Systems Inc.

Other positive developments for the year included big contracts. In February, Mentor announced a three-year, \$15 million deal with Intel Corp. for its electronic design automation tools. A contract with Motorola Inc. was reached in May that could eventually exceed \$50 million. And last June, the U.S. Air Force signed a \$2.2 million order, Mentor's largest sale ever to a government agency, to maintain and update computer resources for F-16 weapons systems.

Mentor is already working on release 8.1 of the Falcon Framework for some workstations, and it is well along toward porting the remainder of its tools this year to seven workstation platforms. A version for IBM's

RS/6000 is scheduled to ship in the third quarter of 1992.

Bruggere is pinning his hopes on the future. "The key thing in 1991 for us—other than the fact it's over—was our shipping of release 8.0. We've gone from a situation in 1990 of supporting one platform to 1992 and supporting seven. We feel pretty good about things in that regard."—Paul Pinella



After ASK Computer Systems Inc. acquired Ingres Corp. in 1990, the company essentially squeezed the database software maker into its own management organization, thereby creating a single sales, support and product development function. Although this strategy allowed ASK's executives to pinpoint and fix problems affecting Ingres, it also delayed important decision making and created little synergy in sales.

So last summer ASK officials under chief executive officer Sandra L. Kurtzig shifted organizational gears and broke the company into three independent business units: ASK Computer Systems, responsible for traditional minicomputer manufacturing applications and for development of a new line of client/server-based products for UNIX; Data 3, focused on integrated manufacturing applications for the IBM AS/400 market; and Ingres, ASK's database and productivity tools component.

The new game plan seems to be working. Corporate revenue for the year, while naturally up due to the acquisition and greater-than-expected growth in the Ingres division, increased 58% to \$394.6 million.

Unfortunately, this achievement was blemished by a \$57.6 million loss due largely to a \$63.3 one-time write-off for goodwill and purchased intangibles related to both the Ingres and Data 3 Systems Inc. acquisitions. Analysts attributed the loss to an accounting albatross left over from ASK's preference to make cash, rather than stock swap, acquisitions. Most predict it will have little impact on future business.

The recession did take a bite last year out of ASK's bread-and-butter manufacturing resource planning (MRP II) software; sales were flat for the MANMAN and MAXCIM applications. But this was offset by gains in Europe from the other two units' database and AS/400 software. Ingres, in particular, sharply rebounded from the general slump that plagued many database companies in 1990. "We will do \$250 million [in Ingres software] by June," says Kurtzig. "And that's pretty healthy growth."

To get growth back on track in its core manufacturing base, ASK is counting on Advance, its next-generation client/server manufacturing software based on UNIX and the Ingres database. Over a year late, the preliminary general ledger release went beta in early 1992. Customer shipment is now scheduled for first quarter 1993. Kurtzig attributes the delay to unforeseen networking challenges and customer uncertainty in moving critical manufacturing from proprietary minis to workstations. "Advance is late," she admits. "But that's because it's very hard to define exactly what people want."

Despite the delays in Advance, few analysts seem worried over the company's long-term prospects. The reason: manufacturing companies as a rule tend to be conservative in terms of data processing. So, even if the switch from minis to workstations takes several years, ASK can use the time to perfect its code.

Is another acquisition in the cards for 1992? "The straight answer is no," says Kurtzig. "But there are a lot of



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people coming to us who want to be acquired. And we are in an interesting position."—Paul Pinella

IS Revenue **\$390.0 Million**

69

EASTMAN KODAK CO.
343 State Street
Rochester, NY 14650
(716)-724-4000

A picture may be worth a thousand words, but Eastman Kodak Co.'s is still a little out of focus.

Kodak has dabbled in many information businesses, but success has been elusive. Now the film and copier company hopes a clearer strategy is emerging as the dust settles from a restructuring whose billion-dollar cost consumed 1991's 2.7% increase in revenues, which topped \$19.4 billion, leaving a massive \$688 million loss.

Kodak entered last year with its diverse information businesses tied together into a new Commercial Imaging Group in an effort to sharpen both focus and margins. By November, a further restructuring had combined the microfilm, copier and related information segments in a new Office-Imaging subdivision of the group.

DATAMATION estimates Kodak's IS revenues—from electronic information processing, storage and retrieval businesses, and from sales of printers—at \$390 million in 1991, an increase of 11.4% over 1990's level.

A broad strategy is in place: Kodak will leverage its consumer products technology into the office to capture, store, retrieve, reproduce and distribute data and images.

To this end, Kodak has stepped back from proprietary systems. It intends to blend its own image-capture, printing, copying and distribution with other vendors' workstations and retrieval products into a number

of hybrid products spanning many technologies, from optical storage discs to PC network-linked printers that double as copiers. Indeed, the latest digital copiers can be programmed to edit or personalize copies; with floppy disks they can process a mailing list.

One such hybrid product, the Photo CD, should come to market later this year. Although a consumer product, it is expected to be used by businesses for storing, manipulating and distributing information. But first the high costs of putting images on a disc, and making copies of the disk must be brought down, says David A. Nadeau, the imaging group's director of sales operations for North America.

Criticism that Kodak has lacked a coherent approach to information systems brings forth the explanation that it is dealing with many niche markets. Nevertheless, Nadeau believes the company must invest more, and put more emphasis on the information segment if it is to remain, as it is in Kodak's view, the dominant player in the business-imaging market. —John Morris

IS Revenue **\$377.0 Million**

70

SYSTEMATICS INFORMATION SERVICES INC.
4001 North Rodney Parham Road
Little Rock, AR 72212
(501)-220-5100

America's banks might be in trouble, but their troubles mean increased revenue for outsourcing firms, as banks turn to them to cut data-processing costs. Systematics Information Services Inc., which sells a suite of banking software and provides both in-house and off-site outsourcing, has found this environment much to its liking.

Revenues leapt up 47.8% to \$377 million in 1991. Most of that—85%—

comes from Systematics's outsourcing business. Only 12% comes from software and a mere 3% from other sources.

And business was up sharply in 1991, spurred by some large contracts. Systematics penned a five-year, \$80-million facilities management contract with Federal Home Loan Bank Of San Francisco, and it took over the data-processing operations of Decatur Federal Savings and Loan, one of the largest S&L's in Georgia.

Systematics does almost all of its business in the United States, but in October it signed a three-year, \$6.7 million contract to provide its Virtuoso cellular telephone-billing system software to Unitel Personal Communications in London.

Increased business in outsourcing, however, means increased costs, and Systematics's operating income didn't rise quite as sharply as its revenues. A wholly-owned subsidiary of Alltel Corp., Systematics reports 1991 operating income of \$39 million, up 14% from the previous year's level. That slow growth relative to its revenue is a direct consequence of absorbing new business. When Systematics wins an outsourcing contract, it often purchases the bank's computer system and shifts some of the bank's data-processing employees to its own payroll. Systematics added slightly more than 1,000 employees in 1991, an increase of over 30%. It's sort of like trying to swallow a watermelon whole.

Systematics closed out the year with a major acquisition that should strengthen its position in the mortgage-servicing section of the market. In December, it arranged to acquire Computer Power Inc., a Jacksonville, Fla.-based company that provides data-processing services for mortgage-lending institutions. Computer Power earns revenues of about \$100 million a year. The deal was completed in the first quarter of 1992 for 7.64 million shares of Alltel valued at about \$270 million.

—Elizabeth Lindholm



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72

IS Revenue **\$370.0 Million**

71

NORTH AMERICA

3COM CORP.
5400 Bayfront Plaza
Santa Clara, CA 95052
(408)-764-5000

Ascaled down 3Com Corp. emerged in 1991, fresh from its decision in January to concentrate on network adapters, hubs and bridges. In the process, it rid itself of work-group-related businesses, including the LAN Manager operating system. The move proved very costly: 3Com took a one-time restructuring charge of \$67 million and, with fewer product lines, saw a drop in revenues.

As a result, 3Com's 1991 annual numbers were not pretty. Total revenues for calendar 1991 were down 15% to \$370 million. The company lost \$33 million, compared with a net gain of \$24 million the year before. 3Com also reduced its work force by approximately 14%, ending up with 1,676 workers at year's end.

Clearly, 3Com felt it had no choice but to transform itself from a company focused on client/server computing to one competing in the global data-networking business, moving away from connecting desktops and toward connecting local area networks.

The old 3Com was a hodgepodge of businesses, all competing for precious development dollars; company executives claimed that it was consequently hard for salespeople to stay up to speed on all the product lines.

That previous product diversity was clearly shown just in the businesses from which 3Com exited in 1991. All development and marketing of LAN Manager were turned over to Microsoft Corp. Additionally, Communications Solutions Inc., which makes connectivity products for IBM's System Network Architecture (SNA), was sold to Attachmate Corp. And, unable to find a good buyer, 3Com wound down its work-group systems

businesses, which included LAN servers, workstations and related software.

The change has left a very different 3Com. Work-group-related systems had contributed \$113 million, or almost a quarter, of 3Com's revenues in 1990. That figure dropped to roughly 11% in 1991 and should drop to almost nothing in 1992. 3Com is hoping to pick up the slack primarily with its Network adapter division. In the second half of 1991, that division contributed 72% of sales.

To boost the adapter business even further, 3Com announced in January 1992 that it would acquire the data-networking products of U.K.-based BICC PLC, which 3Com describes as Europe's largest hub manufacturer. The deal cost 3Com \$25 million in cash and a warrant for 500,000 shares of 3Com stock. As a result, 3Com took a \$10.4 million charge in the quarter that ended February 29, 1992, but expects revenues to grow significantly this year as a result.

3Com continued to invest quite heavily in research and development (approximately 12% of total revenue) and has the products to show for it. In September, it announced two major reduced instruction set computing products: the LinkBuilder 3GH hub and a new bridge/router, the NETBuilder II. Both demonstrate 3Com's focus on providing multiple protocols and on supporting various bandwidths within single, scalable platforms. For example, the LinkBuilder 3GH delivers both Ethernet and Fiber Distributed Data Interface (FDDI) to the desktop.

"We continue to see evidence that our global data-networking strategies are working," says Eric Benhamou, 3Com's president and chief executive officer, pointing to the new product introductions and sequential quarterly sales improvements. Additionally, the company has started shipping products through a newly formed Japanese joint venture and began construction in Ireland of its first European manufacturing facility.

3Com may be on the right track, but whether these moves will be enough to recoup lost momentum is still a big question.—*Susan Kerr*

IS Revenue **\$355.0 Million**

72

NORTH AMERICA

DIEBOLD INC.
818 Mulberry Road
Canton, OH 44707
(216)-489-4000

Last year may have been a tough year for IBM, but the computer giant's influence was still great enough to help Diebold Inc. achieve its best year ever. In September 1990, Diebold and IBM combined their automated teller machine operations into a joint venture, InterBold. One of four Diebold business units, InterBold, exploited IBM's overseas marketing might to help drive Diebold's foreign revenue up 21% in 1991.

In a tough year for the banking industry, Diebold's overall revenue grew 6.3% in 1991 to \$506.2 million. Product sales accounted for 55% of the total revenue (and service income for 45%). Net income, meanwhile, rose a substantial 31.7% to \$35.7 million. DATAMATION estimates Diebold's IS revenues at \$355 million, up 8.1% from 1990's level.

InterBold unveiled a new line of modular ATMs in October and expects the so-called *i* Series to drive sales this year and beyond. Offering a 99% availability guarantee, the *i* Series ATMs come in various configurations and allow users to add modular upgrades rather than replace an entire ATM. Available modules provide features such as a multimedia dispenser that can handle airline tickets, postage stamps and other items, and "image-lift" technology that scans and displays the images of deposited checks.

The new ATMs can also accept an advanced terminal processor (ATP)



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module, which incorporates an Intel 80386SX microprocessor and runs the OS/2 operating system. Among other benefits, the ATP module supports InterBold's Software Extended Application, which lets financial institutions easily customize their ATM software and upgrade the units' functions. ATMs can also be connected into the same local area networks that support bank branch workstations and electronic security systems.

Aside from the InterBold ATM operation, other Diebold business units include the Diebold Security Products group, which offers electronic monitoring, access control and alarm systems, as well as physical security products, such as vaults. The North American Sales and Service unit maintains Diebold and other company products at more than 400 customer locations. And the Diebold International Sales and Service unit—just established in December—is working with IBM's World Trade Organization and with foreign distributors to accelerate the company's growth overseas. Diebold plans to increase international revenue to 40% of its total by 1996, up from the record 22% achieved last year.—Dwight B. Davis



CADENCE DESIGN SYSTEMS INC.
555 River Oaks Parkway
San Jose, CA 95134
(408)-943-1234

When you think Cadence Design Systems Inc., think mergers and acquisitions. The manufacturer of computer-aided design and engineering (CAD/CAE) software for the electronics design industry is itself the result of a 1988 merger between SDA Systems Inc. and ECAD Inc. Four years and four mergers later, the company has built itself into the leading

seller of electronic design automation (EDA) software, according to market researcher Dataquest Inc. of San Jose.

Although M&A fever has made Cadence a hot EDA vendor, it hasn't made the company's financial figures any healthier. The spending spree, highlighted by Cadence's \$200 million merger with Valid Logic Systems Inc. in December, is causing the company to come up short in the profit column. After raking in a \$6 million profit in 1990, last year's net earnings disappeared in a \$22 million sea of red ink, while total revenue inched up only 0.5% to \$392 million. IS revenue growth outstripped the paltry 0.5% gain in total revenue, rising 9.6% to \$353 million.

While Cadence points to the strength of its finances overall, and to its impressive market share, the soft economy has taken a toll on the company's business. Sales for the first half of the year dipped, as Cadence's normally robust customer base of manufacturers hesitated on purchasing decisions. As a result, the company's revenue dropped nearly 15% in the first quarter. But, fueled by a slight uptick in the economy and news of the Valid merger, sales rallied in the fourth quarter.

Following the merger, former Valid president and chief operating officer L. George Klaus was appointed executive vice president and COO of Cadence. The company is also merging the Valid and Cadence product lines, a process that will continue throughout this year.

The merger gives Cadence a commanding 24% market share in electronic design automation software, according to Dataquest—twice as much as its nearest competitor, Mentor Graphics Corp. It also means layoffs. Cadence cut about 10% of its work force, beginning in January, due to redundant positions resulting from the merger.

But misery loves company. Competitor Mentor Graphics reported a whopping \$61.6 million loss for 1991, citing the same weak economy and slumping EDA sales.

On the brighter side, in October

Cadence announced a multiyear, multi-million dollar pact with Fujitsu Microelectronics Inc. to build a new integrated circuit design system. The following month, the company introduced version 4.0 of its Dracula IC verification software and the InQuery graphical debugging software.

—Mike Ricciuti



MICROPOLIS CORP.
21211 Nordhoff Street
Chatsworth, CA 91311
(818)-709-3300

As it celebrated its 15th birthday in 1991, Micropolis Corp. found out that security does not necessarily accompany maturity. Revenue for the disk drive manufacturer decreased 7.9% to \$350.9 million in 1991, after swelling 24.1% the previous year. Net earnings were nearly cut in half, diving 46.3% to \$4.3 million.

Yet despite a difficult year, which included a \$3.8 million loss in the third quarter, Micropolis remained cautiously optimistic. The reason was a slew of new products introduced in 1991 and greater emphasis on the distributor and reseller channels versus the tough original equipment manufacturer (OEM) computer supplier market.

Because new-product shipments had yet to take hold by year's end, Micropolis was unable to make up for revenues lost by aging products. In October, Micropolis announced a 2.4-gigabyte, 5.25-inch drive, which it claims is the highest capacity drive of its size in the market. The product is designed to replace systems that now use 8-inch drives, a disappearing market. In fact, Micropolis claims the yearly revenue decline resulted primarily from 60 to 70% drops in sales of its mature 85, 170 and 380MB full-height drive products and from declining



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75

demand for its 180MB half-height 5.25-inch drives.

Of all of Micropolis's new 1991 products, the one with the most hope attached to it was the 1.05-gigabyte 3.5-inch drive, the model 2112. First-evaluation units shipped in the fourth quarter, but Micropolis didn't ship in volume until the second quarter of 1992. Called the highest-capacity 3.5-inch drive by the company, the model 2112 is Micropolis's first entry into the large workstation market.

Other significant products include the RAIDION redundant array of inexpensive disks (RAID) product line, introduced in September. It's the first level-5 RAID certified for use with Novell NetWare software, and with it Micropolis hopes to take advantage of the increased demand for high-transaction, fault-tolerant data storage in the network file server market.

Even with new products, tough times are still ahead for Micropolis. Its traditional OEM base of computer systems manufacturers is contending with its customers' continued moves toward downsizing, and the recession has lasted longer than anticipated. While a recovery may be in the offing, Micropolis president and chairman Stuart P. Mabon warns Micropolis watchers to not to get overly excited. "The demands of what is essentially a high-technology commodity business will keep the pressure on disk drive manufacturers," he says.

—Susan Kerr

IS Revenue



\$342.0 Million

**POLICY MANAGEMENT
SYSTEMS CORP.**
 Intersection of I 77 and U.S. 21 North
 Blythewood, SC 29016
 (803)-735-4000

G. Larry Wilson is one president and chief executive who can say his company completely accomplished its

strategic and financial goals in 1991. And he has the numbers to prove it. His firm, Policy Management Systems Corp., which provides software and services to the insurance industry, especially benefited from an explosion of new contracts for outsourcing.

PMSC reported corporate revenue of \$415.3 million in 1991, hitting its 20% annual growth target dead on. Net earnings rose 28% to \$47.5 million. IS revenue grew 25.7% to \$342 million. Healthy expenditures on research and development—a strategy partially responsible for the firm's success, analysts say—totaled \$68 million in 1991, or about 16% of revenue.

The company has been moving steadily from its base as a supplier of software solutions for small- to medium-sized North American property and casualty insurance companies to a provider of all types of insurance applications for all size companies worldwide.

IBM's equity investment in PMSC two years ago—now at 16.5%—gave the company the credibility it needed to sell its Series III product family to some of the biggest insurers in the industry, say analysts. Last year, pressures within the insurance industry helped make those companies buyers of PMSC's outsourcing services, as well as its software products.

PMSC met strategic goals on a number of fronts in 1991, Wilson says. The firm issued release 3.0 of Series III. The new release included enhancements to its property and casualty applications and its life and health insurance applications. In addition, new life and health products were key to PMSC's strategy to broaden its base in insurance.

With the new release, Series III is about one-fifth the way to its ultimate goal, says Wilson. The new Series III products are heavily oriented toward cooperative processing, a computing environment that insurers are being forced to adopt for competitive and economic reasons, Wilson asserts.

While PMSC is a full-blown services firm, all of its services are based on its own software products. That's why its heavy R&D investments are crucial, say analysts. "The insurance industry is very complicated. Getting business expertise in insurance is very expensive," says an analyst who requested anonymity. "No one else is as well positioned as PMSC."

Another key strategy in 1991 was to move aggressively into overseas markets. PMSC and IBM jointly opened a solution support center in Cologne, Germany, and PMSC also operates large data centers in Australia and the United Kingdom. PMSC signed outsourcing agreements with three big European insurers and one Australian insurer in 1991 and expects snowballing growth in its overseas business this year.

Wilson projects such overseas growth because, he says, European insurers are under general economic pressures to become more global and are under pressure from the European Community to become pan-European.

Wilson's future challenge will be to maintain the firm's growth across all fronts, however. Development for the company's next release of Series III, scheduled for the first quarter of 1993, is well under way. PMSC expects to move further into the health field with more managed care products and will continue to expand in the life insurance market. Wilson predicts some acquisitions within the next year to move these goals ahead faster.

Analysts don't foresee any problems in PMSC's ties to IBM. Despite IBM's mainframe foundations, PMSC is proactively moving its customer base away from mainframes into cooperative-processing environments. "IBM helped PMSC get its foot inside some doors, but PMSC has a very balanced approach—the company and the customer come first, and then its relationship with IBM," comments the analyst.

—Leila Davis



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PROFILES



76 MAI SYSTEMS \$328.6 M

77 BOEING \$325.4 M

78 TERADATA \$297.0 M

79 SAS INSTITUTE \$295.1 M

80 AMERICAN MANAGEMENT \$285.2 M

81 COMPUTER TASK GROUP \$285.1 M

82 AUTODESK \$284.9 M

83 TEKTRONIX \$283.0 M

84 FISERVE \$281.3 M

85 DATAPOINT \$263.9 M

86 GERBER SCIENTIFIC \$261.0 M

87 CABLETRON \$257.4 M

88 SYNOPTICS \$248.3 M

89 CONCURRENT \$238.0 M

90 REYNOLDS & REYNOLDS \$232.8 M

91 ZEOS \$230.9 M

92 ADOBE \$229.7 M

93 STERLING \$228.9 M

94 PYRAMID \$221.6 M

95 NATIONAL DATA \$220.6 M

96 SEQUENT \$213.3 M

97 LEGENT \$207.8 M

98 BOLT BERANEK & NEWMAN \$206.6 M

99 INFORMATION BUILDERS \$202.3 M

100 GENICOM \$200.5 M

- LARGE-SCALE SYSTEMS
- MIDRANGE
- PCs
- WORKSTATIONS
- SOFTWARE
- PERIPHERALS
- DATACOM
- SERVICES
- MAINTENANCE
- OTHER

NORTH AMERICAN COMPANIES



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76
77

IS Revenue

\$328.6 Million

NORTH AMERICA

MAI SYSTEMS CORP.

2642 Michelle Drive
Tustin, CA 92680
(714)-731-5100

MAI Systems Corp. thrived for nearly 20 years by building minicomputer systems and software that small and medium-sized companies use to run their businesses. Four years ago, when competition from high-end PCs and from more established minicomputer companies began to nibble at the market MAI had targeted, it changed strategies.

First it tried to diversify, in a well-publicized but unsuccessful attempt to acquire Prime Computer Inc. Then it stopped making its own minicomputers to become a value-added reseller (VAR) of other systems. The idea was to add applications it had developed for a half-dozen years to newer systems. Nothing seemed to work.

In 1991, MAI reported a 14% decline in revenues to \$328.6 million and a loss on those revenues of \$59.8 million, which was, nevertheless, an improvement over 1990's \$85 million in red ink. Analysts attributed MAI's poor showing to a reduced demand for midrange computer systems in Canada and the United States and to competitive pricing of current products. They also blamed the poor results on discounting of older MAI equipment. But the problems seemed to go much deeper, warranting still another change in strategy.

So MAI is taking yet another route: it's becoming a systems integrator with a little bit of value-added reselling along the way, according to its new marketing vice president, Sam Gagliano. And by this summer, it plans to drop many of its VAR agreements which, Gagliano says, have spread the company too thin. He says MAI, in consultation with systems

integration clients, will decide which hardware platforms would meet the needs of specific applications.

At the heart of its new strategy is the company's existing customer base of 25,000 owners of old MAI computer systems. In 1991, half of its revenues came from serving and maintaining these systems. It has formed a business systems operation to provide enhancements to these customers. MAI has also formed an industry solutions group to offer new customers software applications in manufacturing, wholesale distribution, general accounting and health care.

The new strategy is in the hands of MAI's third president in three years, Peter Andersen, who last year joined the company from Western Union Corp. He replaced eight of the company's 10 line managers and slashed the payroll more than a third, down 1,200 to 2,300.

Early this year, there were signs the new approach could be paying off. In the last quarter of 1991, losses totaled only \$2 million, after two successive quarterly losses of \$26 million. It was the smallest loss in six quarters. Stay tuned.—Tom McCusker

IS Revenue

\$325.4 Million

NORTH AMERICA

THE BOEING CO.

7755 East Marginal Way South
Seattle, WA 98108
(206)-655-1131

As in past years, more than 80% of Boeing Computer Services's revenue in 1991 came from providing computing and telecommunications services to its parent, The Boeing Co. That internal business, in turn, was buoyed when the aircraft manufacturer ramped up production of its new 777 wide-body twinjet. The demands of that program helped boost BCS's 1991 revenue up 15.7% to \$1.92 billion.

Ironically, the computer group's 777 windfall ate into corporate Boeing's profits. To support the 777 program, Boeing's research and development budget grew 71.7% to \$1.42 billion in 1991. Even with the added R&D expense, though, corporatewide net earnings grew 13.1% in 1991 to \$1.57 billion, and revenues grew 6.2% to \$29.31 billion.

For Boeing Computer Services, the large increase in the internal demand for its work wasn't matched by its external business arm: external business accounted for \$325.4 million of the 1991 total revenue, up just 1.7%. Federal government contracts accounted for fully \$247 million of that external revenue, reflecting BCS's decision during the 1990-1991 period to exit the commercial marketplace. The company still accepts commercial work, but doesn't actively pursue it, according to Stan Beckelman, vice president of information services at BCS.

"The federal government seems to offer enough opportunities to keep us occupied," he says. Those opportunities come from civil agencies—especially the National Aeronautics and Space Administration (NASA)—as well as from the Department of Defense.

The highlight of 1991 for BCS was when it won a \$1.6 billion contract from the U.S. Army Information Systems Selection and Acquisition Agency. Under the 12-year contract, Boeing and its subcontractors will implement the Reserve Component Automation System (RCAS). The goal of RCAS is to reduce the time soldiers spend on administrative tasks, thereby allowing more time for readiness preparation and training.

BCS won the contract last October, following a year-long competition with Computer Sciences Corp. CSC contested the award, but the courts gave the go-ahead to Boeing at the very end of the year. Thanks to the RCAS revenue flow, Beckelman expects this year's external business



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to show more substantial gains than it did last year. The internal arm, meanwhile, may slow some as production of the 737 jet is cut back.

With the RCAS business, the number of external staff members will grow more than 14%, from about 2,800 employees to about 3,200 by year's end, Beckelman estimates. Given the amount of federal work available, BCS could grow even faster, he says, if it could find enough qualified personnel. "Staff capabilities are a significant resource for us, and the people we need are in short supply," he says. If BCS expands too fast without the necessary staff experience, Beckelman says, the company's high success rate in competing for contracts would probably suffer, which, in turn, would raise the cost of landing new business. —Dwight B. Davis

IS Revenue **78** \$297.0 Million
NORTH AMERICA

TERADATA CORP.
100 North Sepulveda Boulevard
El Segundo, CA 90245
(310)-524-5000

Teradata Corp. introduced its first database management computer system in 1984 and never looked back. The start-up went on to five years of 100%+ compound annual growth and was lauded in the press as America's fastest growing company. Last year, revenue climbed 25.3% to \$297 million for 1991, topping the previous year's 24.9% jump. Teradata's net earnings reached \$9.1 million.

In early 1990, Teradata had formed a close technology partnership with NCR Corp., but last year found itself weighing the option of an escape clause, following AT&T's acquisition of NCR. Instead of escaping, Teradata was embraced: in December, the company agreed to merge with NCR for an AT&T stock

swap, a move Teradata's shareholders approved this February.

Teradata's name will live on, but only on the side of the massively parallel DBC/1012 database management machines, which the company created and which NCR will continue to sell and support. Teradata's development and manufacturing operations have been folded into the NCR Large Computer Products division, while its domestic marketing operations have been used to help create the Large Computer Systems division within NCR's United States Marketing Group. International Teradata marketing groups have been merged into NCR's local marketing organizations. Most of Teradata's 1,600 employees have been retained, although about 175 administrative staff were let go.

Among those leaving was Kenneth W. Simonds, who had been Teradata's chairman and chief executive officer. "Following AT&T's acquisition of NCR, it made a lot of sense for us to get together with them," he now says. "Our parallel-processing technology has the potential to make a major contribution to future computing architectures, but we needed the horsepower of a company like AT&T to achieve that goal."

NCR was already a believer in the DBC/1012's design, which bundles together anywhere from a few to several hundred standard microprocessors and employs an intelligent interconnection network to manage database entries and queries. NCR licensed some of Teradata's technology for use in the NCR 3600, a general-purpose parallel mainframe computer. The AT&T subsidiary had also established a joint development organization with Teradata to pursue further parallel-processing innovations; that work continues within the newly named NCR Torrey Pines Development Center.

Customers who want only a dedicated database machine can still buy the Teradata processors from NCR, but the corporate emphasis is to move

users to more general-purpose parallel architectures. Embodied as the NCR 3600 and the future NCR 3700, these parallel machines will not only support database management operations but also UNIX-based transaction-processing applications.

—Dwight B. Davis

IS Revenue **79** \$295.1 Million
NORTH AMERICA

SAS INSTITUTE INC.
SAS Campus Drive
Cary, NC 27513
(919)-677-8000

Although many still consider SAS Institute Inc. to be a vendor of statistical packages, the company is quietly becoming a major force in commercial IS.

A growing number of users have made the SAS System For Information Delivery their primary software system, replacing or augmenting systems from such traditional IS heavyweights as Computer Associates International Inc., Oracle Corp. and even IBM. The SAS System, which comprises SAS's collection of modules and database tools for data access, management, analysis and presentation, found a new home at 2,600 new user sites in 1991, to bring the worldwide total to just over 23,000.

SAS's revenue jumped 22.9% in 1991, to \$295.1 million. According to SAS president Jim Goodnight, PC software was a big gainer in the product line; revenue for SAS Software under DOS and OS/2 was up 25%. VMS and ULTRIX climbed 20%, and revenue from mainframe software, while dead last, still managed to climb 18% over 1990's levels.

In 1991, the company introduced the SAS System for seven UNIX variations including Digital Equipment Corp.'s RISC/ULTRIX, IBM's AIX, Next Computer Inc.'s NeXTstep and



Silicon Graphics Inc.'s IRIX.

Another factor driving sales, says Goodnight, is that when SAS System users need to install a new application, many purchase SAS modules, like SAS/Graph for data graphing or SAS/Calc, a spreadsheet module, instead of buying stand-alone applications from other software vendors. That's a situation SAS wants to cash in on this year—selling users packages that run on the base SAS System to perform specific tasks, such as SAS/EIS, an executive information system that the company introduced earlier this year.

Other highlights from 1991 include the August shipment of an updated SAS/C compiler and the September announcement that SAS will be a partner in the IBM Information Warehouse, Big Blue's framework for corporate data access. Earlier this year, SAS began shipping its next-generation version of its system, release 6.07. —Mike Ricciuti

IS Revenue

285.2 Million

80

NORTH AMERICA

AMERICAN MANAGEMENT SYSTEMS INC.
 1777 North Kent Street
 Arlington, VA 22209
 (703)-841-6000

Despite a slowdown in some of its key markets, systems integrator American Management Systems Inc. grew 1991 revenues 8.9% to \$285.2 million. Net earnings were up 11.5% to \$11.6 million.

AMS sells consulting services and software products to manufacturing, financial, government and telecommunications companies. The 22-year-old company's bread-and-butter business, systems integration for telecommunications and financial services firms, essentially dried up in 1991.

Company chairman Charles O. Rossotti says those parts of AMS's

business felt the effects of a general economic slowdown during 1991, leaving government-consulting contracts and new product development to pick up the slack.

Imaging is one area into which AMS is venturing. In 1991, the company began selling the Image and Record Management (IRM) system, codeveloped with IBM (which holds a 10% equity stake in AMS).

In 1991, AMS also struck a deal with NYNEX Mobile Communications to develop a customer management and billing system for the cellular telephone industry. And earlier this year, the company said it would develop custom applications for Grid Systems Corp.'s wearable pen computer, the PalmPAD.

AMS is currently working on PalmPAD applications for the U.S. Navy. Those applications will be used for taking inventory of hazardous material and for keeping track of ship maintenance. The company has also built pilot PalmPAD applications for utility data collection and bedside hospital care.

The company also stepped up its international expansion. In 1991, its international business increased by 43% over 1990's level and now accounts for more than 10% of AMS's total services and products revenue.

—Mike Ricciuti

IS Revenue

285.1 Million

81

NORTH AMERICA

COMPUTER TASK GROUP INC.
 800 Delaware Avenue
 Buffalo, NY 14209
 (716)-882-8000

You'd think Computer Task Group Inc., which earns its keep by helping those big, big, really big *Fortune* 100 firms make their information systems work faster, better, smarter or cheaper, made out like a bandit last

year. After all, the company saw revenue rise by 16.9% to a tad over \$285 million. But net earnings plummeted 87.7% to a mere \$890,000 due to the cost of acquisitions and increases in tax provisions.

Of course, the big jump in revenue didn't just happen by itself. CTG set out in 1990 to increase its communications services capabilities, for example, when it announced plans to acquire systems integrator Connolly Data Systems Inc. and Telecommunications Management Consultants, and boosted its international consulting practice with the purchase of Rendeek International N.V., an IS professional services firm based in Amsterdam, The Netherlands.

Last year, CTG concluded those deals and then set about remaking itself to better respond to a tsunami of customers clamoring for help implementing advanced technologies.

The result, says Stephen Hoffman, CTG's senior vice president for marketing and sales, is a corporate restructuring that has divided the company into eight new ready-for-anything business practice groups.

The business practice approach represents a new strategy for CTG, says Hoffman. In the past, CTG has been a branch-based organization structured around its 65 worldwide offices. The new structure will be based on technology practices, which will provide support to the branch offices.

"We've always had specialty businesses and services, but by introducing new business practices divisions we will be able to employ certain valuable skills that already exist in the firm and focus them more fully on behalf of clients' specific needs," says Hoffman.

The eight new technology-based practice divisions comprise:

1. CTG's new Communications Systems practice, which subsumes both CTG's own communications services business unit, as well as the newly acquired Connolly Data Systems (renamed the Network Systems Integration unit) and



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Telecommunications Management;

2. The all-new Information Engineering practice, which will emphasize the use of a standard computer-aided software engineering development methodology across all branches of the company;

3. The Information Media practice, CTG's attempt to bring multimedia capabilities to its consulting, training and integration services;

4. The Migration Services practice, aimed at helping clients move applications, databases and hardware to new operating systems, platforms and development environments;

5. The Database Consulting practice;

6. The Industrial Systems Integration practice;

7. The Image Systems practice, intended to help clients install and use imaging systems to manage workflow;

8. The Project Management practice.

What's driving CTG's restructuring into business practices? "We want practitioners to introduce advanced technologies to the highest possible degree within the firm and make those technologies directly available to our customers," says Hoffman.

—J. William Semich



As its revenue growth rate continued to slow in 1991, PC-based computer-aided design software market leader Autodesk Inc. began to make a concerted push into new markets.

The company continued to enhance its workhorse AutoCAD product, adding a new release—number 11—and a Windows version. Autodesk also, however, announced multimedia and

molecular-modeling software packages and laid plans to enter the information services business.

"In the past, our strategy has been to provide production CAD tools to the mass market and specifically to give 80% of the function of high-end systems for 20% of the price," says Autodesk vice president for European operations Volker Kleinn. While Autodesk continues to pursue those goals, "we want to expand away from the perception of being a one-product company," Kleinn elaborates. "We want to move into other technologies that provide benefits to our existing customers and that help widen our markets."

Accordingly, non-AutoCAD revenue in 1992 will amount to 13 or 14% of Autodesk's total, says Kleinn.

In 1991, however, 91% of Autodesk's revenues continued to come from AutoCAD, which most analysts say still commands between 65 and 70% of the PC-based computer-aided design market. Thanks to the effects of the recession—particularly on architectural and building markets—and to slowdowns in some international markets, Autodesk saw revenue growth dip to 19.8% in 1991 compared with the 33% growth rate the company enjoyed in 1990. Its \$284.9 million in 1991 revenue produced earnings of \$57.8 million, up 1.8%.

To lead Autodesk into new markets and perhaps faster growth, the company's board of directors in early 1992 hired former Sun Microsystems Inc. field operations vice president Carol Bartz as Autodesk's new president, chief executive officer and chairman. Bartz replaced Alvar J. Green, who retired from Autodesk in October.

Autodesk's 1991 move into new markets saw the company introduce and ship the PC-based HyperChem Molecular Modeler. The product was actually developed by independent software vendor HyperCube Inc., in which Autodesk purchased a 22% interest in 1989.

In multimedia, Autodesk intensified its efforts by enhancing its Animator

products. Autodesk added an upgraded version called Animator Pro and a 3-D-modeling, -rendering and -framing product called 3D Studio.

And late in 1991 Autodesk began rolling out American Information Exchange, a new information value-added network product. Autodesk expects independent information vendors such as newsletter publishers and even small software vendors to use American Information Exchange to distribute their products to PC users.

Autodesk has its eye on other new product areas, as well. Kleinn says the company has plans to build new products for both the front and the back end of the design/manufacturing process. "AutoCAD is currently used mainly in production drafting. We plan to provide tools for other areas, such as conceptual design and even for integrating design documents into the manufacturing process," says Kleinn. Autodesk cofounder and programmer John Walker is currently working on melding AutoCAD with computer-integrated manufacturing (CIM) products at the company's European Software Center in Neuchâtel, Switzerland.

Autodesk expects something of a rebound in 1992. With the help of several new products due to ship this year—including release 12 of AutoCAD—and a rally in the world economy, Kleinn says, Autodesk expects to report a 28% increase in revenues in 1992.—Jeff Moad



What was to have been a turnaround period for Tektronix Inc. became yet another frustrating year in 1991. The maker of test and measurement



systems, TV studio equipment, and computer printers and terminals managed to turn a \$70 million loss in 1990 into a \$44.9 million profit in 1991. But revenues slipped 6.4% to \$1.31 billion for the company as a whole, and DATAMATION estimates that IS revenues ended the year down 2.9% to \$283 million.

Hurting this year's performance was a \$17.3 million restructuring charge incurred last winter for severance costs and asset write-downs. Tektronix's employee count had fallen to 11,464 at the end of the third quarter, down from 12,001 a year earlier.

Within this bleak economic tableau, a new color printer managed to raise spirits at the pioneering electronics company. Introduced last summer, the \$10,000 Phaser III printer was the first to use a solid ink technology, making it able to produce brilliant colors on plain paper and other media. Demand for the Phaser III has exceeded the company's expectations—and driven a 50% growth rate within Tektronix's printer business.

Buoyed by Phaser III sales, printer revenue (which includes thermal color printers as well) should reach \$185 million in fiscal 1992, or about 14% of overall corporate revenue, estimates Richard S. Chu, a Cowen & Co. analyst in Boston. By spring of 1993, printer revenue should hit \$225 million, he predicts.

Another graphics product area—X terminals—hasn't come through for Tektronix as well. Although X terminal shipments are growing "at a hefty clip," revenue from their sales is not yet high enough to replace the declining income from sales of the company's older graphics terminals, says William R. Spivey, vice president of the Computer Graphics Group.

Further down the road, Tektronix expects to bring to market flat-panel display products based on liquid crystal technology developed within its highly regarded in-house labs. In addition, by this time next year, analyst Chu predicts, Tektronix will probably

have shoehorned the solid-ink Phaser III technology into printers costing \$6,000 or less. Even so, it won't be easy for the company to hold onto its advantage in this sector: of the color printer business, Spivey acknowledges. —Dwight B. Davis



Data-processing services firm Fiserv Inc. bought its way onto the North American DATAMATION 100 when it "swallowed the whale," as one analyst put it, and acquired Citicorp Information Resources Inc. The purchase supplemented its steady 20% internal growth, boosting revenues 53.7% to \$281.3 million. At the same time, net earnings for the company, which concentrates on the financial-services industry, jumped 29% to \$18.3 million.

Swallowing CIR, Citicorp's own data services company, was accomplished with apparently little indigestion despite its size, since virtually all of the CIR management was retained. In addition, Fiserv's management team visited hundreds of CIR clients to reassure and retain them. What's more, Fiserv remained hungry enough to gobble up another service bureau, BMS Processing Inc., now Fiserv Boston, and the data-processing operations of two banks—the Federal Home Loan Banks of Chicago and Dallas—before the year's end.

Economic woes in the financial services industry, combined with the high cost of staying technologically competitive, have made financial institutions ripe for Fiserv's data-processing services and outsourcing. The company also has a number of government con-

tracts to maintain the DP operations of failed savings and loans held by the federal Resolution Trust Corp.

All 1991 acquisitions were financed out of cash flow from operations and from the proceeds of a public stock offering of 1.3 million shares of common stock, which netted \$47 million.

Even the addition of CIR-developed software systems is going smoothly, say both analysts and Fiserv president and chief operating officer Leslie Muma. Fiserv had not marketed software packages before the CIR acquisition. Muma expects CIR's International Comprehensive Banking System software and its International Financial Institutions Consulting business to expand Fiserv's modest overseas business.

Earlier this year, Fiserv acquired a maker of plastic credit and debit cards to round out its automated teller machine (ATM) offerings. Muma predicts further acquisitions in 1992, concentrating specifically on growing Fiserv's core business as a service bureau and on two closely related areas: item processing and ATM services. "We are very focused in what we do," says Muma.

Despite the constant acquisition activity, analysts say Fiserv is moving slowly and appropriately in its growth. Growth of internal operations is keeping pace: 158 new clients—over 100 requiring full services—were added in 1991 apart from the acquisitions. Separate from the CIR purchase, Fiserv picked up a contract to do Citicorp's corporate payroll for three years at \$20 million per year.

Fiserv's biggest challenge, according to analysts, will be to continue growing as the number of financial institutions shrinks. Broadening its service bureau business to include item processing and additional ATM systems is expected to help future growth. Muma also predicts that the company will move into image processing for financial institutions in the near future. —Leila Davis



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IS Revenue **\$263.9 Million**

85

DATAPOINT CORP.
8400 Datapoint Drive
San Antonio, TX 78229
(512)-593-7000

Datapoint Corp.'s fortunes brightened in 1991. Despite a slight 0.6% dip in revenue to \$263.9 million, the company reported net earnings of \$346 thousand—its first annual profit in several years. That compares with a loss of \$66.7 million on revenues of \$265.6 million in 1990.

A major product announcement this year could bode well for the future, as well. Datapoint finally rolled out ARCnet Plus in January 1992. ARCnet Plus is the enhanced version of ARCnet, Datapoint's flagship product and one of the earliest local area network architectures.

ARCnet Plus, as might be expected, adds new features and functions, the most important of which is speed. ARCnet operates at a data rate of 2.5 megabits per second, far too slow for many applications, such as graphical user interfaces and database management systems. ARCnet Plus offers a speed of 20Mbps, slightly faster than 16Mbps Token Ring, but slower than 100Mbps FDDI.

However, Datapoint will be facing some tough sledding in the LAN architecture market. In the interim between ARCnet versions, Ethernet, Fiber Distributed Data Interface (FDDI) and Token Ring have eclipsed the older network architecture, becoming de facto standards in the fast-growing LAN market.

Nevertheless, ARCnet still has a cadre of users, particularly overseas. The company continues to close some big sales, primarily in Europe, which accounts for 84% of the company's revenue. And, despite its problems, ARCnet has retained about 11% of the U.S. LAN market, according to Santa Clara-based InfoCorp.

What's more, Datapoint has been taking steps to counter its problems. In 1987, the company formed the ARCnet Trade Association, which is petitioning the American National Standards Institute (ANSI) for approval of ARCnet as an official standard. That approval could occur later this year and open doors for ARCnet sales in the government market.

—Bob Francis

IS Revenue **\$261.0 Million**

86

GERBER SCIENTIFIC INC.
83 Gerber Road West
South Windsor, CT 06074
(203)-644-1551

Tough times are especially tough on a company like Gerber Scientific Inc., whose computer-aided design and manufacturing (CAD/CAM) systems serve on the front lines in several factory automation niches. When the factories cut production, Gerber is quick to suffer.

The company's revenue totaled just \$261 million, down almost 7% from the previous year. Net earnings dived 77% to \$7.4 million.

Gerber's main line of defense is to keep research and development spending high and to keep new products in the pipelines at its five subsidiary branches. In 1991, R&D spending actually rose 5.1%, and the company introduced several key new products.

These products include the Crescent Laser Photoplotter from the Gerber Scientific Instrument Co. The photoplotter—which generates films for the manufacture of printed circuit boards—is the company's first such system under \$100,000. Gerber Garment Technology Inc., meanwhile, added the AccuPlot 700-VHD-CSX plotter/pattern cutter to its extensive line of products aimed at the apparel

industry. The other three subsidiaries—Gerber Scientific Products Inc., Gerber Optical Inc. and Gerber Systems Technology Inc.—are also attempting to stimulate sales with a barrage of new products for their target markets.

Gerber also has been busy on the legal front, pressing a patent infringement case against France's Lectra Systemes SA. Last winter, a U.S. court-appointed Special Master recommended that Lectra pay Gerber \$4.7 million, plus interest, for infringing upon certain patents dealing with automated fabric-cutting equipment. At press time, the recommendations were under consideration by the U.S. District Court in Northern Georgia. The company, which holds close to 1,000 patents, is pursuing several other lawsuits both domestically and in Europe.

Despite the hard times, Gerber holds one major advantage over its competitors, which are generally much smaller companies, says Peter Russo, treasurer and corporate controller. The company generates a lot of cash, and had \$40 million to \$50 million on its balance sheet this spring. "As a result, we can be very price competitive," Russo says. Gerber has also loaned money to some of its customers, who then use it to buy Gerber equipment, effectively setting up a leasing arrangement, he explains.

—Dwight B. Davis

IS Revenue **\$257.4 Million**

87

CABLETRON SYSTEMS INC.
35 Industrial Way
Rochester, NH 03867
(603)-332-9400

When George Bush went looking for New England's economic vital signs during February's New Hampshire primary campaign, he paid



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88

a visit to Cabletron Systems Inc. It was a shrewd choice for a photo opportunity. This enterprising New Hampshire-based manufacturer of intelligent hubs, integrated network management software and other networking products has been one of the brightest points of light to be found in the U.S. economy during the last four years.

Entrepreneurs extraordinaire, Cabletron's chairman and chief operating officer Craig R. Benson and president and chief executive officer Robert Levine have parlayed their little cabling supply business—founded in Levine's garage in 1983—into the niche-market darling of Wall Street.

Cited by *The Wall Street Journal* as the company with the best-performing stock on the New York exchange in 1990, Cabletron then went on to have its best year ever amid the bleak New England recession of 1991. IS Revenue for the year jumped 71.5% to \$257.4 million, and net earnings climbed 69% to \$52.4 million.

Building on its solid foundation of cabling services, transceivers, network interface cards and other physical-link level products for local area networks, Cabletron entered the intelligent hub market in 1988 with the introduction of its Multi Media Access Unit (MMAC), the industry's first modular smart hub.

MMAC, like rival SynOptics Communications Inc.'s LattisNet System 3000 and other intelligent hubs, permits the interchangeable use of disparate network media, including Ethernet, Token Ring and Fiber Distributed Data Interface (FDDI), running over any type of wiring, including low-cost unshielded twisted pair.

According to Chip Pettirossi, network industry analyst for International Data Corp. in Framingham, Mass., 1991 unit sales for MMAC closely rivaled those of SynOptics's market-leading LattisNet product and far outpaced low-cost offerings from Chipcom Corp. and

David Systems Inc. "Our estimates indicate that Cabletron added approximately half a million nodes to its MMAC installed base in 1991," says Pettirossi. And the market is far from mature. "Only about 15% of the potential market for these products has been tapped," he says. "We can expect average growth for smart hub vendors to continue at 50 to 60% per year over the next four years."

But Cabletron is not your average smart hub vendor. In late 1990, the company burst out of the wiring closet with its expert systems-based Spectrum network management system. Spectrum, which is targeted at large enterprise networks, integrates various proprietary network management platforms and permits simultaneous management of multiple LAN topologies and protocols. For Cabletron, it is the capstone of an integrated network architecture and the basis for a systems integration strategy that has transformed this tiny company into a formidable large-account competitor for Digital Equipment Corp., Hewlett-Packard Co. and IBM.

As a consequence of Spectrum's success, Cabletron now faces the tough, yet enviable, management challenges that inevitably plague growth companies. Its roster of 2,300 employees represents an increase of 90% over 1990. As its installed base continues to expand and the complexity of its product offerings increases, efficiency could become difficult to sustain—without rubbing customers the wrong way.

Nevertheless, CEO Levine is optimistic. "As we've gotten larger, we've managed to maintain the same ratio of personnel devoted to technical support," he points out, adding that repeat business from satisfied customers represents 68% of Cabletron's annual revenue—a striking percentage for a young company in a growth market. "We presently have 800 full-time employees devoted exclusively to service and technical support," boasts Levine. —Don Marks

IS Revenue\$248.3 Million

**SYNOPTICS
COMMUNICATIONS INC.**
 4401 Great America Parkway
 Santa Clara, CA 95052
 (408)-988-2400

While some smart-hub vendors can't see the network for the nodes, SynOptics Communications Inc.—best known for its high-end LattisNet System 3000 intelligent hub—has focused its energies on establishing partnerships with large distributors and value-added resellers who provide total network solutions.

This multichannel distribution strategy, coupled with key product development relationships, has helped this young and lean 1,000-employee spinoff of Xerox Corp.'s Palo Alto Research Center grow into a networking powerhouse.

Laying claim to an installed base of 2.3 million nodes, or 38% of this burgeoning network management market, SynOptics was for most of its seven years the dominant smart-hub vendor. But despite a solid performance in fiscal 1991, including 41.1% revenue growth to \$248.3 million, the company fell short of many analysts' predictions. For the first time since its founding in 1985, SynOptics's annual revenue trailed behind that of principal smart-hub competitor Cabletron Systems Inc. Still, with respectable earnings of \$26.8 million—which while down 5% from 1990's level, still represents 10.8% of revenue—and with revenue per employee at \$248,000, the company's financial position remains extremely strong.

Although it faces a vigorous challenge from Cabletron, SynOptics recently has taken aggressive steps to regain its preeminent position.

First among these were sharp fourth-quarter price reductions of 38 to 40% on all of SynOptics's Ethernet products. Michael Szabados, director



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of systems marketing, says the price cuts helped stave off price-driven competitors, such as Chipcom Corp. and David Systems Inc. Also, to reach the growing low-end Ethernet market, SynOptics introduced a 10BaseT Ethernet hub designed for small, stand-alone networks of 12 to 100 nodes, priced at under \$200 per node. The result was an immediate uptick in sales; fourth-quarter revenue exceeded third-quarter results by 7%.

Next, SynOptics groomed its overcrowded U.S. distribution channels. According to Doug Gold, network industry analyst for the Framingham, Mass.-based market research firm International Data Corp., the company simply had too many partners. "It got to the point where they were stepping on their own toes," Gold says. "Distributors and VARs were competing for the same deals." At the same time, SynOptics beefed up its thinner European channels through the addition of several resellers and distributors, including Anixter in Britain and Ing C. Olivetti & Co. SpA throughout Europe. International sales more than doubled to \$74 million in 1991.

Finally, the company maintained its long-standing commitment to new-product development. More than 42% of 1991 revenue stemmed from products less than 12 months old; research and development expenditures for the year exceeded \$30 million, more than 12% of revenue. Several of SynOptics's most important new products, however, originated from strategic alliances. A joint development project with IBM resulted in a new industry standard for 16-megabit-per-second Token Ring connections over unshielded twisted pair wiring. And a partnership with Sun Microsystems Inc. produced LattisNet Manager For UNIX, a suite of integrated network management modules built on Sun's SunNet Manager.

Despite this recent spate of savvy management decisions, concerns over SynOptics's marketing strategy still linger. As smart hubs become more of a commodity, crucial resellers could

defect to lower-priced competitors. And although technological innovations could sustain customer interest for a time, without an internal systems integration capability like Cabletron's to insulate it from cutthroat hardware competition, SynOptics could risk becoming the Compaq of the smart-hub industry.—Don Marks

15 Revenue \$238.0 Million

89

CONCURRENT COMPUTER CORP.

2 Crescent Place
Oceanport, NJ 07757
(908)-758-7000

Until last November, it looked as though Concurrent Computer Corp. would drown under its weighty burden of debt. At the time, three major bondholders were petitioning the highly leveraged real-time systems maker to seek protection under Chapter 11 of the bankruptcy code. Revenues sank 19.6% to \$238 million, with a consequent \$17.6 million operating loss.

But, by instituting Draconian expense controls and through ingenious financial maneuverings, the company managed to avoid Chapter 11. In late November, chairman and chief executive officer Denis R. Brown pulled off a recapitalization, which reduced junk bond debt by \$61.1 million and gave 70% of Concurrent's equity to bondholders. This resulted in a one-time gain that pushed net earnings to \$14.4 million, compared with a \$60 million loss the year before.

Having pulled the company through two tough years of restructuring, during which Concurrent laid off 1,000 people, Brown now says he "feels great." The typically upbeat turnaround specialist says, "I feel that the prospects of the company are considerably improved over what they were."

But senior manager of investor relations Barbara Pistilli says Concurrent is not yet in a position to forecast short-term performance. "The highly competitive environment and poor economic conditions make it very hard to predict earnings at the current level of revenue."

Contributing to the difficulty in making accurate forecasts is Concurrent's development of UNIX-based systems, which will begin to replace its current proprietary line sometime this year, says Brown. Those new products will bring lower profit margins, which Concurrent can ill afford.

It's possible that Concurrent could make up the difference by selling a higher volume of products to customers who are demanding standard systems, however.

After a lean 1991 during which the company made only one major product announcement—the Series 7000, a Motorola 68040-based computer line—the company, which spends about 10% of revenues on research and development, now expects to steadily roll out systems and software over the next few years, says Brown. "We have plans to release new products like normal companies do," he says. "The real message is: We're now a normal company."

But Concurrent still faces challenges. Brown is trying to build confidence in the firm's finances by consistently paying debt two months ahead of due dates, and he says the firm's cash level is higher than it's been in a long time. The company even managed a small operating profit of \$2.3 million in the fourth quarter of 1991. His recent promotion of executive vice president John T. Stihl to the president and chief operating officer spot reflects Brown's feeling that, now over the financial crisis, he can focus on strategic marketing and partnering issues. "We are now getting our organization in place for the long haul," he says. "Before, we basically divided up all the problems."

—Elaine L. Appleton

NORTH AMERICAN COMPANIES



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90
91

IS Revenue **90** \$232.8 Million

NORTH AMERICA

REYNOLDS AND REYNOLDS CO.
115 South Ludlow Street
Dayton, OH 45402
(513)-443-2000

It was a good news bad news year for Reynolds and Reynolds Co. in 1991. After struggling to maintain essentially flat revenue in 1990's stagnant market, revenues from its IS division dropped a further 8.4% to \$232.8 million last year.

And total revenue for the firm, which apart from vertical market computer systems also supplies business forms, was down 2.6% to \$592 million.

But a combination of stringent cost controls, the sale of unprofitable business in Australia and reduced expenses as the company fully amortized the cost of product development for its medical software resulted in an impressive 12.8% gain in net earnings for the IS operation to \$25.6 million.

The company is looking for IS revenue recovery partly by focusing on its core business of providing information systems and services to U.S. auto dealers. The major obstacle is the overall sluggish economy, which continued to hold down new car sales.

Reynolds is also sticking with a strategy of expanding into the back shops at auto dealerships. Although the market is still shrinking, company officials claim the approach has helped Reynolds gain a better share of what remains.

Last year, the company introduced a new version of its ERA dealership system built on NCR Corp.'s Tower machines. The system incorporated two industry standards—Bell & Howell Co.'s auto parts catalog based on compact disc, read only memory (CD-ROM) and Mitchell International's bar code system for automated body repair estimates.

This year, Reynolds introduced version 7.0 of ERA at the 1992 National

Auto Dealers Association show. The new version integrates the body shop with the in-house system, linking the parts inventory with the business office and other areas of dealership.

General Motors Corp., Nissan Motor Co. Ltd. and Volvo AB have all recommended Reynolds systems to their dealers. Such endorsements gave a boost to industry trends that were already helping to drive growth in Reynolds's IS division. Sales were also strengthened by GM's announcement that it would discontinue the use of paper catalogs beginning in 1994.

Reynolds focused exclusively on the auto industry before 1987, when it purchased National Medical Computer Services, which markets a physicians management system for hospitals. Although the San Diego-based subsidiary has yet to contribute significantly to Reynolds's revenues, it's no longer a drain on resources.

Reynolds officials reported that in 1991, NMC Services turned the corner and began generating a profit, largely on the strength of a new system aimed at expanding the subsidiary's share of the IS market for group practices.

—Chris Sicula

IS Revenue **91** \$230.9 Million

NORTH AMERICA

ZEOS INTERNATIONAL LTD.
530 Fifth Avenue, Northwest
St. Paul, MN 55112
(612)-633-8033

"Upgradable" doesn't just describe Zeos International Ltd.'s line of desktop PCs—it describes the company. A whopping 81.7% boost in revenue to \$230.9 million and a meteoric 145% net earnings growth to \$10.3 million blasted the direct market PC source into the top 100 North American IT suppliers.

Introduced in July, the upgradables were important, says Zeos chairman and chief executive officer Gregory E. Herrick. But he adds that the hot product of 1991 was really the 6.6-pound ZEOS Notebook 386, accounting at times for more than 50% of sales, and driving the company last March to announce it would double its manufacturing capacity.

Ironically, that's the very product the company is expected to replace this summer with an all-Zeos-built design. (The original was made by Sanyo Electric Co. and assembled by Zeos.) Herrick says rolling its own notebook will enable Zeos to cut costs and add unique features that will differentiate a Zeos notebook in a cookie-cutter market.

That sounds good to Ruth Sadler, administrative assistant at Pfizer Specialty Minerals Group in Easton, Pa., who purchased two dozen of the Sanyo-based notebooks from Zeos. While those have served well, Sadler expects a vendor that can build its own hardware to be more responsive to customer-requested design changes.

Help with the redesign will come from PC Tech Inc., acquired by Zeos early this year. PC Tech also helped design Zeos's upgradable line. Some cash for research and development came by way of Zeos's 1991 public offering of 2.4 million shares of common stock, which also may help fund the company's expected 1992 European expansion. Herrick says ad copy and pricing are translated and ready to go in France, Germany and the United Kingdom, and that an as-yet-unnamed ex-Dell Computer Corp. employee has been tapped to spearhead European operations.

Steven L. Eskenazi, analyst in New York City for the market research firm Alex. Brown & Sons Inc. of Baltimore, says Zeos should find fertile sales territory in Europe, where it will face less direct competition. Domestically, Zeos's main challenge is execution, Eskenazi says, pointing out



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that Zeos's phenomenal 1991 notebook sales flattened in early 1992 because competitors like Dell Computer Corp. rolled out their home-built notebooks first.

Of course, another way Zeos might edge out Dell and Gateway 2000 Inc. could be to move beyond its direct-marketing roots and hit retail shelves—a possibility tipped by the 1991 opening of a Zeos factory outlet store in St. Paul. Herrick says there's no plan to tap retail channels—then again, he won't rule it out. If the store “were wildly successful,” says Herrick, “I think we'd be remiss if we didn't open another one.”

—Ned Snell

IS Revenue  **\$229.7 Million**

NORTH AMERICA

ADOBE SYSTEMS INC.
1585 Charleston Road
Mountain View, CA 94043
(415)-961-4400

Adoobe Systems Inc. could do no wrong in 1991. The typeface technology company had a 36.1% revenue gain to \$229.7 million for 1991, and net income rose 28.7% to \$51.6 million.

The company's bottom line got a boost from new licensing agreements with Apple Computer Inc., Digital Equipment Corp. and Lotus Development Corp. Apple and Digital will resell Adobe products to their customers; Lotus has incorporated Adobe font technology into the Windows versions of its 1-2-3 spreadsheet, Ami word processor and Macintosh-based products.

Adobe's horizons are not cloud free, however. The company's Adobe Type Manager (ATM) and add-on fonts are facing a tough challenge in the add-on typeface market from Microsoft Corp.'s TrueType technology, embedded in Windows version 3.1. Adobe's fonts are not compatible with the

TrueType font management software. For Adobe to continue strong sales of ATM, it will have to convince users to discard TrueType fonts included with Windows and switch to ATM—not an enviable task.

But Adobe chairman and chief executive officer John Warnock says he isn't worried. He cites Adobe's revenue figures, saying only 4% is derived from retail sales of type fonts to PC users.

The nine-year-old company has also traditionally relied on royalties from the licensing of Adobe's PostScript page description language to printer manufacturers. But as the price of printers incorporating the technology has dropped, so have Adobe's royalties.

With that in mind, the company is hard at work on Carousel, which will offer document-linking and compound document-building features similar to those provided by the Object Linking and Embedding (OLE) technology found in Windows. But, unlike Microsoft's current version of OLE, Carousel will allow documents to be linked across desktop operating systems and platforms.

Warnock says Carousel will ship by the end of 1992 or early in 1993. The company says it has lined up several technology partners, including Apple, to support the Carousel technology.

By far, the strongest revenue growth area for Adobe has been its applications business, up 64% in 1991. Growth was driven by sales of Adobe Illustrator design and illustration software, which began shipping in a Windows version this spring, and by Adobe Photoshop, a scanned photo enhancement package for the Macintosh.

Adobe entered the multimedia business in 1991, when it purchased the rights to a new product, dubbed Adobe Premiere, from SuperMac Technology. Premiere works with Apple's QuickTime media integration technology on the Mac to let users create and assemble full-motion digital video.

—Mike Ricciuti

IS Revenue  **\$228.9 Million**

NORTH AMERICA

STERLING SOFTWARE INC.
Suite 1100
8080 North Central Expressway
Dallas, TX 75206
(214)-891-8600

Sterling Software Inc. showed respectable revenue growth last year of 10.6% to \$228.9 million. Net earnings grew 5.6% to \$13.1 million. The company, which has acquired 13 other companies since going public in 1983, acquired two more information services companies last year: Knowledge Systems Concepts, which became part of Sterling's Federal Systems Group; and the Redinet Services Division of Control Data Corp., a provider of electronic data interchange services. That's now part of Sterling's EDI Group.

The company is actually made up of three major product groups. The Systems Software Group generates about 40% of revenue; that's up from 37% in 1990. The Federal Systems Group accounts for 37% of revenue, down from 43%. The EDI Group generates about 20% of revenue, up from 12% in 1990, its first year of operation as an independent group.

The company continued last year to develop the three-part software development strategy of its Systems Software Group. The idea is to stay with its 90,000 customers in their move to advanced-computing systems and client/server development and support. As Sterling president and chief executive officer Sterling Williams puts it: “Our role is clear—to lead the transition from the unconnected information systems of the 1980s to the enterprisewide computing systems of the '90s, and beyond.”

The elements of its three-part strategy, announced in 1990, include the company's Corporate Storage Management Initiative (CSMI) in the Software Group's storage manage-



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ment, division; the Corporate Applications Management Initiative (CAMI) in its applications development and information management division; and the Corporate Data Communications Initiative (CDCI) in its data communications division.

As part of CSMI, the company continued to work last year on its Project Eagle to develop system managed storage products for distributed systems. Sterling also acquired a software development facility located in Tefen, Israel, and announced its GALIL local area network-based storage management product plans. As part of CAMI, Sterling merged its Answer Systems Division into its Dylakor Division, bringing together its applications development and information products under a single development and marketing team. And as part of its CDCI, the company released a new product, Supertracs Software Protocol Converter for OS/2.

With its large user base and some \$135 million in order backlogs for software and services, Sterling's future looks relatively secure. Wall Street appeared to agree with that prognosis last year; Standard & Poor's Corp. raised its rating of Sterling's subordinated debt from Single-B-Minus to Single-B as the year drew to a close, and gave the company an implied senior rating of Single-B-Plus.

—J. William Semich



Chairman and chief executive officer Richard H. Lussier highlights three factors that help to explain Pyramid Technology Corp.'s disappointing 1991 financial results. First, the recession

led many customers to postpone purchases of Pyramid's multiuser UNIX servers.

Second, says Lussier, many customers interested in UNIX have become confused about whether to go with networks of small workstations; with large, centralized hosts; or with intermediate servers. That's cut growth overall in the UNIX multiuser market, Lussier explains, and hurt Pyramid.

And third, competition has picked up as established vendors such as Data General Corp., Hewlett-Packard Co. and Sun Microsystems Inc. have introduced large servers to compete with Pyramid's.

Consequently, Pyramid saw its results gradually deteriorate as 1991 progressed. After more than doubling earnings to \$18.4 million in 1990, the company ended up reporting an \$11.1 million loss for 1991, thanks largely to a disastrous fourth quarter in which Pyramid lost \$18.5 million. Pyramid's revenues for the year were up only 10.6% to \$221.6 million after vaulting 75% the previous year.

Lussier might have added a fourth factor in explaining Pyramid's troubles, particularly late in 1991 and early in 1992. That would be Pyramid's strategy of relying heavily on original equipment manufacturers to help sell and distribute its products. Pyramid was relying especially on AT&T as its primary OEM customer in the U.S. and received \$61 million in revenue from AT&T in 1991.

But AT&T's acquisition last year of NCR Corp. dealt a blow to Pyramid's OEM business. Pyramid's revenues generated from AT&T began to drop sharply in late 1991. In the first quarter of 1992, AT&T contributed only \$3 million to Pyramid's revenue line.

Lussier, however, says he plans to continue pursuing his strategy of obtaining about 50% of Pyramid's revenues from OEM customers. He's currently searching for another large U.S. OEM customer. And, in 1991, he signed a new Japanese partner, Kobelco, a subsidiary of Kobe Steel Ltd.

The recession also complicated Pyramid's efforts to pull off a major product transition in 1991. The company introduced and began shipping its S series of reduced instruction set computing UNIX servers, based on the R3000 microprocessor from Mips Computer Systems Inc. By the first quarter of 1991, however, only about 33% of Pyramid's revenues were coming from S series products. That was somewhat less than Lussier had hoped for.

Pyramid's 1992 results will be heavily dependent on some additional products that are in the works and a major government contract. Later this year, Pyramid plans to ship a 40 to 45% price/performance upgrade of its S series. Pyramid also hopes it can cash in on the major contract it won in July 1991 to supply the U.S. Treasury Department with 3,200 server systems over a five-year period. The contract, which Pyramid won in cooperation with AT&T, has been held up by challenges from IBM and Lockheed Corp.

If those measures don't help turn Pyramid around in 1992, Lussier says, some additional restructuring will be in order. Specifically, Lussier says he will consider whether to replace costly direct sales organizations with distributors or to withdraw from some markets altogether.—Jeff Moad



In a move that was long overdue, National Data Corp. finally began to clean house in 1991, after years of inactive management, few new products and services, and some erosion of market share.

NORTH AMERICAN COMPANIES



But housecleaning never comes cheap. For calendar year 1991, the company dropped 9.8% in revenues to \$220.6 million, with a net loss of \$14.6 million.

Compounding the company's problems has been the slump in the financial services industry, National Data's major market.

The result? Almost all of its top and middle managers were replaced. Former Unisys Corp. executive O.G. Greene was brought in as president and chief executive officer in mid-1991. He began refocusing the company as soon as he arrived and made a number of structural changes. In May 1992, however, the board elected Robert A. Yellowlees as chairman and CEO, and Greene resigned.

Under Greene, National Data released what he says is the first new cash management product in almost five years—Global Exchange, a type of electronic data interchange (EDI) service that allows companies to deal with Treasury-reporting functions on a worldwide basis. According to Greene, the network on which this service is based will eventually be broadened into a platform for all of National Data's financial services.

"The company had not taken advantage of its technical base to add new customers. We have stopped the deterioration and are starting to deliver new products," Greene explained. Greene also consolidated National Data's credit card and cash management divisions into one group, representing about two-thirds of the company's business. The move allows National Data to market all of its financial services through one sales force, using one administrative group and one development group. He is in the process of doing the same with its health care industry services, which represent about 17% of the company.

Two point-of-sale products were also unveiled in 1991 and before his departure, Greene had predicted there would be more new products this year.

National Data also expanded its pharmaceutical claims-processing busi-

ness in 1991, tripling the volume of claims processed each month from the level it was handling a year ago. It's also moving to process claims for dentists in the Southwest and Midwest. In addition, the company has signed a contract with Blue Cross & Blue Shield of Canada to process all of its dental claims, Greene says.

According to analysts, the problems aren't over at National Data, but Greene made a good start in cutting costs and bringing in new business. The company appears to have stabilized, but the next year under Yellowlees will be telling.

"There are bound to be some false starts in any turnaround," suggests Stephen McClellan, an analyst with New York City-based Merrill Lynch & Co. Inc. "The company has lost a lot of ground, and is playing catch-up with a moving target." —Leila Davis



IS Revenue **\$213.3 Million**

SEQUEST COMPUTER SYSTEMS INC.

15450 Southwest Koll Parkway
Beaverton, OR 97006
(503)-626-5700

Rarely in recent years has a systems vendor reversed a precipitous financial decline in as short a time as Sequent Computer Systems Inc. has. The runaway growth of the symmetric-multiprocessing systems vendor stopped short last year. Revenue declined 14.3% to \$213.3 million, and the company lost \$48.7 million, down sharply from net earnings of \$18.8 million in 1990. The loss included restructuring charges of \$22.2 million, which Sequent took mainly to lay off about 450 employees, about 50 of whom have since returned. It was the company's first loss since its founding in 1983.

But all of the decline came in the first three quarters; both revenues and earnings rose in the fourth quarter.

The company turned a modest profit in the first quarter of 1992, and financial analysts say prospects look good for the rest of the year.

Some of Sequent's problems mirrored those of other large-systems vendors. Due to the recession, says investor relations manager John Eldridge, customers deferred or canceled large-system purchases, worth \$500,000 or more; the company instead focused on selling systems costing less than \$100,000.

But not all of its problems could be blamed on the economy. In early 1991, cofounder and president Scott Gibson said that the company had relied too much on sales from original equipment manufacturers (OEMs) like Unisys Corp. At midyear, reports Montgomery Securities in San Francisco, OEM business accounted for only 10% of Sequent's sales, down from 30% the year before. Although Unisys's OEM business picked up early this year, and the companies extended their relationship for another two years, Sequent will continue to shift its focus to direct sales. "OEM accounts are not an integral part of our business plan," says Eldridge.

The burgeoning sales force has more products to sell this year. Sequent's parallel version of Novell Inc.'s NetWare operating system, which shipped late last year, shows promise. In the fourth quarter, the product, which links PC LANs to Sequent's Symmetry database servers, was a "very healthy contributor to our resurgence," says Gibson.

Still, despite high interest in parallel NetWare and favorable ratings for its newest Symmetry 2000/x50 machines, which employ multiple 80486 chips, scrappy Sequent faces some tussles. Hewlett-Packard Co., in particular, is a formidable competitor, and Sun Microsystems Inc. is planning to join the fray. Sun poses less of a problem, however: "I don't worry much about Sun's success," says Eldridge. "It's very difficult to produce true, symmetric multiprocessing platforms."

—Elaine L. Appleton



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IS Revenue

97

\$207.8 Million

NORTH AMERICA

LEGENT CORP.

8615 Westwood Center Drive
Vienna, VA 22182
(703)-734-9494

Legent Corp., like many other vendors in 1991, took a long, hard look down the road and saw that its now-strong mainframe software business will eventually weaken as sales of big iron plummet. Under the direction of president and chief executive officer John Burton, Legent is moving from being a vendor of mainframe systems management software toward becoming an enterprisewide systems management provider.

The strategy seems to be paying off. Legent's revenue rose 15.1% last year to \$207.8 million. Net earnings edged up 4.3% to \$36.2 million.

"Last year was really a catharsis for us," says Burton. "We began to feel economic pressure at the beginning of the year. That forced us to reevaluate our market position and our strategy for the future." The strategy included reorganizing the company's sales force. It also included buying technology—and the vendors who make it. Legent completed nine mergers and acquisitions in 1991. And it doesn't show any sign of slowing down after a merger with mainframe software and utilities vendor Goal Systems International Inc., which was announced this April.

Burton says that instead of keeping the companies it bought in individual divisions, Legent has organized the whole company into technology and sales areas representing market segments. Those segments include Operations, which handles data center operation products; Systems, for system performance software; Applications Management, devoted to products for managing, running and building applications; and Networks, which handles network performance and access

products. A fifth area, called Enabling Technologies, spans all other areas and provides "building block" technologies used in every Legent product, like graphical user interfaces and communications code.

Although the Goal deal is getting the most notice, Burton says Legent's purchase of Spectrum Concepts Inc., announced in September of 1991, was the "most crucial step in us becoming an enterprisewide systems vendor." Spectrum makes a product, called XCOM, that lets Legent tie together systems management software running on multiple operating systems. "It is becoming increasingly difficult to sell mainframe software unless you can demonstrate how it will work with software on other platforms," Burton says. "And that's what we are doing."

With that in mind, Legent is rewriting some of its older products in C so that they will be portable to multiple operating systems, like UNIX. And in April, Legent signed a joint-marketing deal with Landmark Systems Corp. to sell products that display Legent and Landmark mainframe-based system monitors on a PC under Microsoft Windows.

Future acquisitions are not out of the question, says Burton. "We will have to buy some technology to build our products. But I don't see any more on the level of the Goal consolidation."—Mike Ricciuti

IS Revenue

98

\$206.6 Million

NORTH AMERICA

BOLT BERANEK AND NEWMAN INC.

70 Fawcett Street
Cambridge, MA 02138
(617)-873-2000

In a year when everybody and his brother beefed up parallel processor development, diversified systems and software company Bolt Beranek and Newman Inc. backed off and still

squeaked into the North American Top 100. BBN's 1991 revenue of \$206.6 million from IS products and services (out of about \$262.9 million total corporate revenue) is only a couple of million better than 1990's figure. But that 1.1% gain is a small recovery relative to the previous year's 13.5% drop, when revenues plummeted \$30 million. And 1991's \$6.6 million in net earnings is a far cry from the previous year's \$34.8 million of red ink.

Last summer, the company suspended research and development on the successor (code-named "Coral") to its TC2000 parallel-processing system while promising to continue to support TC2000 customers. The rumored effort to form a development partnership with Cray Research Inc. fizzled, and chairman and chief executive officer Stephen R. Levy admits the company can't afford to develop Coral without outside support. "We had to concentrate in areas where we already had strong businesses," Levy says.

In such areas, BBN is investing mightily in R&D—12.3% of revenue, about twice what BBN spent in the 1980s, Levy says. Major development is under way in broadband communications, network access devices, technical data analysis software and simulation systems—all aimed at BBN's traditional base of military and industrial/scientific customers.

In 1991, such products reeled in clients like the U.S. Navy's Space and Naval Warfare Systems Command, which awarded a BBN-IBM team the contract to build a major signal and information-processing system. Late last year, Mead Data Central tapped BBN to build a wide area access network for Mead's LEXIS and NEXIS information services, and the year was capped when *Digital Review* readers voted BBN's RS/1 data analysis software "Best Software for Data Visualization—Scientific and Technical." No doubt these events are part of the reason BBN's roster of products slated to be introduced this

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year includes a new family of desktop software for data analysis and an integrated access device for communications networks. —Ned Snell

IS Revenue **99** \$202.3 Million
NORTH AMERICA

INFORMATION BUILDERS INC.
1250 Broadway
New York, NY 10001
(212)-736-4433

Slowly, but surely—that's the way Information Builders Inc. is making its way up through the ranks of the North American DATAMATION 100. Making its debut last year in the 100th position, the 17-year-old software company is on the charts at No. 99 this year for its 1991 performance. While this increase is not exactly meteoric, that's in part because the company went through a major strategy shift in 1991 with the introduction of a new corporate division devoted to a new product, Enterprise Data Access/Structured Query Language (EDA/SQL).

Since the September 1991 introduction of EDA/SQL, more than 30 companies (including Apple Computer Inc. and IBM) have announced support for the product, which aims at universal, desktop database access. IBI also added alliances with Digital Equipment Corp., Lotus Development Corp. and Pilot Executive Software to its already established list of business partners.

Still, the growth has not been as steady as the company founder and president Gerald D. Cohen might have wished. IS revenues were up a modest 5.9% to \$202.3 million in 1991. Cohen admits that the increase was "a little disappointing," when you consider that the growth rate was 18.8% in 1990. The privately held company does not divulge net earnings figures.

The company had expected the pace

to continue at about the same rate in 1991; Cohen attributes the falloff to the big ramp-up for the new product, as well as to a dismal performance in the European market, which makes up about one-quarter of IBI's revenues.

Meanwhile, sales of IBI's mainstay product, the fourth-generation language Focus, have been proceeding apace. Focus's user base now stands at about 1 million, up 25% from 1990's base. And IBI can hardly be accused of neglecting its other offerings—last year, it introduced release 6.0 of PC/Focus; HiperFocus, a high-performance version of Focus for MVS/ESA; and Level5 Object for DEC VAX/VMS, an object-oriented tool that evolved from IBI's Level5 expert system shell.

The company will try to continue to rack up as many strategic alliances as possible to further Cohen's vision of EDA/SQL as a universal database server. "Every machine that has data on it should be an EDA server," he says. While it remains to be seen how EDA/SQL will fare—it was introduced too late in the year to have a serious bottom-line impact in 1991—IBI is attempting to keep its bases covered for the foreseeable future.

—Lauren Gibbons Paul

IS Revenue **100** \$200.5 Million
NORTH AMERICA

GENICOM CORP.
1 Genicom Drive
Waynesboro, VA 22980
(703)-949-1000

"Brave" may be an apt description of printer, sealed relay and services vendor Genicom Corp., which in 1991 posted a \$13 million net loss. The \$217.0 million revenue total (\$200.5 million from IS products and services) marks Genicom's fifth consecutive year of declining revenues, down 14.9% from 1990's \$255 million and down 28.1%

from \$302 million of 1987. It's a trend president and chief executive officer Paul T. Winn chalks up to "recessionary pressures, increasing competition and rapid changes in the global marketplace."

So what did Genicom do in early 1992? It plunged into one of the most cutthroat markets around, adding a 17-page-per-minute laser printer to its bread-and-butter line of high-speed impact printers—despite havin bombed with its previous laser effort, the 6000 series, which bit the dust in 1990.

Genicom's timing in joining the laser wars when in decline can be questioned, but not its strategy. In its 1991 purchase of Rastek Corp., Genicom acquired an infusion of raster image and page description technology, an important weapon for standing out in the laser market. The first model in the upcoming series, the 7170 Network Laser, is positioned to go head-to-head against laser legend Hewlett-Packard Co.'s LaserJet IIIsi, but boasts a few added features and a lower list price.

While the company hopes sales of its new laser printers will eventually help it recover its core printer revenues (down \$30 million in 1991), its maintenance services, consumables and relay businesses began to grow late in 1991 and may help sustain the company for the near term.

In the meantime, Genicom is taking hard steps to hang on. As part of a three-year recovery plan mapped out in 1990, the company reduced its long-term debt by \$21.7 million in 1991 and streamlined manufacturing by closing one plant and implementing an advanced manufacturing computer system.

Genicom's plan may pay off. While down from 1990's first-quarter income, Genicom's revenue in the first quarter of 1992 is at least higher than it was in the last quarter of 1991. And that's the second consecutive quarterly increase. The company has chosen a tough course. But considering the last five years, Genicom has nothing to lose and all to gain by taking a risk.

—Ned Snell

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THE DATAMATION 100

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A CAHNERS PUBLICATION

DATA[®]MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

Andy K. Ludwick (right), president,
Kevin Woods, product marketing manager,
SynOptics Communications Inc.,
with the LattisSwitch
System 3000

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Europe's IT Sales Plummet 17% To \$35B

"Things are going so fast, so fast," laments Groupe Bull CEO Francis Lorentz. In Europe in 1991, the changes were fast, the cuts deep and the industry shocked.

At the beginning of 1991, Europe's information technology companies were coming off of a dismal year and bracing for more of the same. What they got was something far worse.

"It was a shocking year," says Amit Chaudhuri, an analyst at the market research firm International Data Corp. in London. "For the first time in the industry, revenue growth just stopped. The big suppliers hit a brick wall."

And the brick wall crumbled. The largest European IT suppliers—those in the DATAMATION European 25—collectively saw revenue drop 17.2% from year to year, down \$7.2 billion to \$34.6 billion. Three key factors contributed to this decline. Last year's acquisition spree means that some companies formerly on this list no longer appear, as their revenue has been consolidated into that of their purchasers. The list itself, according to figures from IDC, reflects about one-third of the entire European information technology industry. And, finally, 1990's weak dollar had artificially inflated last year's revenue growth.

Still, the effect of this economic disaster on Europe's IT firms is difficult to overstate. Francis Lorentz, chair-

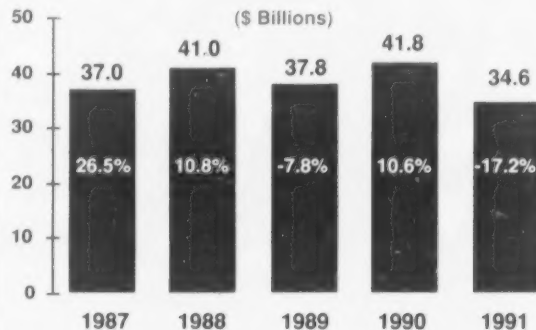
man and chief executive officer of Groupe Bull SA, was typical of his European colleagues in that he was utterly blindsided by the severity of last year's recession. He had expected the European IT market to grow in the neighborhood of 10%, he says—a far cry from the heady days of the 1980s, but wildly optimistic in retrospect. Last year the whole European IT industry grew a paltry 3.3% to \$127 billion, according to IDC. Says Lorentz: "We had to ride out a storm the magnitude of which we could not have foreseen." Hans-Dieter Wiedig, chairman and CEO of Siemens Nixdorf Informationssysteme AG in Munich,

Germany, concurs. "This has been the most difficult year the industry has ever experienced," he says.

Across the industry, firms competing for the smaller pie have suffered drastic price cuts and slimmer margins. Furthermore, corporate Europe's poorer-than-expected performance is widely believed to indicate a fundamental change in the economics of the industry in Europe as in the United States. There is a feeling among both vendors and users that IT expenditures have reached some sort of natural limit, having already soared to board-level importance in the last decade.

Five-Year Revenue Rollercoaster

The 25 largest Europe-based IT suppliers were rocked with a double-digit revenue decline dropping below 1987 levels.



MIS managers are now weighing purchasing decisions more carefully, and to a greater extent than ever before they're buying new products more for replacement than expansion. Consequently, vendors have come to recognize that the glory days of high growth and fat margins in hardware products have ended.

The European 25 hardware vendors saw collective revenues from mainframes, midrange machines, PCs and workstations fall 18.8%. Overall, hardware vendors throughout the industry

BY FREDERICK V. GUTERL

THE DATAMATION 100

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saw sales fall by almost 5%, according to IDC figures. Whereas rapid expansion had been corporate Europe's main priority for most of the last 15 years, cost controls have now taken on prime importance, prompting even more far-reaching measures than last year's slashing of work forces. At most firms, the crisis has prompted vendors to accelerate shifts in corporate identities: hardware firms are ramping up continuing efforts to sell software, while software firms are strengthening their resolve to sell services and consulting.

The newest twist to this corporate rethink: last year, technology-sharing agreements with so-called strategic partners became the centerpieces of corporate policy for several of Europe's big hardware suppliers. For example, Bull's main motivation for selling IBM a 5% stake was to avoid having to undertake costly development of its own reduced instruction set computing technology.

Such a move was unthinkable to Bull

executives even a month before talks started in autumn of 1991. But, said CEO Lorentz in a recent interview with DATAMATION: "We are now in a world where things are going so fast, so fast....If you would have asked me last September about a potential agreement with IBM, I would have said it's unbelievable, it's crazy for us to make an agreement with IBM...but IBM has changed, the world has changed, and IBM and ourselves are quite a bit different from what we were."

Sharing technology to cut costs is a response to an increasingly desperate situation for Europe's hardware vendors. With the exception of ICL, all reported losses last year. Industry observers have criticized many firms for not acting quickly enough to seek corporate partners. In particular, critics have reproached Siemens Nixdorf for its apparent determination to go it alone despite its continuing heavy losses. By moving closer to parent Siemens AG in marketing and development, fol-

lowing Siemens's acquisition of all outstanding SNI shares, SNI hopes to be able to maintain its investment across its broad product range.

Ing. C. Olivetti & Co. SpA, which lost L450 billion (\$362.6 million) last year, has come under increasing fire for not joining forces with a stronger partner. Analysts have long expected Olivetti to be put up for sale and doubt whether the company can survive long in its present form.

Despite the fervor for technology sharing, some analysts doubt whether it will be enough to stem the losses that Europe's big IT firms have suffered for the last few years. With the European single market due to be implemented by year's end, many observers believe a massive restructuring is due for the industry. They believe suppliers, despite their rhetoric that the days of protected domestic markets are over, haven't grasped the urgency with which they should trim the fat in their organizations. "It's still too easy for these

The DATAMATION European 25

EUROPEAN RANK	'91	'90	WORLD RANK	'91	COMPANY	1991 IS REVENUE	1990 IS REVENUE	% CHANGE	1991 TOTAL REVENUE	IS AS % OF TOTAL REVENUE	NET EARNINGS	
											'91	'90
1	1	9			Siemens Nixdorf	7,308.6	7,654.7*	-4.5%	7,308.6	100.0%	-470.8	N/A
2	2	11			Olivetti	6,050.8	6,414.5	-5.7%	6,935.5	87.2%	-326.6	50.8
3	3	12			Groupe Bull	5,929.8	6,349.6	-6.6%	5,929.8	100.0%	-585.2	-1,246.0
4	5	18			ICL	3,308.1	2,862.9	15.6%	3,308.1	100.0%	72.8	122.6
5	8	34			Cap Gemini	1,776.3	1,684.9	5.4%	1,776.3	100.0%	99.3	112.9
6	6	40			Memorex	1,533.1	1,634.9*	-6.2%	1,552.5	98.7%	-385.9	-68.9
7	11	52			Finsiel	1,015.6	816.7*	24.3%	1,086.5	93.5%	23.8	22.0*
8	12	62			BT	823.6	776.8	6.0%	23,500.9	3.5%	3,728.4	3,142.1
9	14	64			Comptel	752.3	589.4	9.1%	752.3	100.0%	18.1	26.0
10	13	69			Racal	679.0	625.2	8.6%	3,681.7	18.4%	220.3	205.7
11	15	73			Sema Group	640.5	533.4	20.1%	727.5	88.0%	18.7	18.5*
12	16	80			Sligos	569.3	530.7	7.3%	569.3	100.0%	30.3	29.4
13	18	95			SD-Scicon	472.7	455.6	3.7%	472.7	100.0%	37.2	-17.2
14	—	98			Getronics	442.5	362.7	22.0%	442.5	100.0%	28.5	25.6
15	—	103			Software AG	429.2	361.4*	18.8%	429.2	100.0%	N/A	N/A
16	23	104			SAP	426.2	308.8*	38.0%	426.2	100.0%	74.3	50.8*
17	21	105			GSI	422.8	375.3	12.6%	422.8	100.0%	18.6	17.0
18	—	116			Logica	348.9	338.9*	2.9%	348.9	100.0%	0.0	9.4
19	22	118			Dowty	340.4	348.1*	-2.2%	1,356.3	25.1%	70.5	97.7*
20	24	121			CGI	315.6	289.1	9.2%	315.6	100.0%	29.7	26.4
21	17	122			Amstrad	313.4	518.7	-39.6%	701.6	44.7%	-35.1	60.4
22	25	129			Reuters	284.5	264.7	7.5%	2,586.6	11.0%	404.6	367.8
23	—	130			Origin	283.4	215.3	31.7%	283.4	100.0%	4.5	11.5
24	20	131			Norsk Data	282.0	383.5	-26.4%	282.0	100.0%	-126.0	-20.6
25	—	147			Tulip	215.5	214.7	0.4%	215.5	100.0%	8.7	10.1

* Restated figure N/A= Not available
All revenue figures are in \$ millions

OVERVIEW

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Europeans to sit back and say, "OK, we're making losses, but at least we've lowered our debt," says analyst Susan Anthony of Robert Fleming Securities Ltd. in London.

That European companies are having a hard time overcoming their historical dependence on protected markets has given U.S. companies, used to a more competitive situation, a leg up. Although the relatively stable dollar meant that U.S. suppliers could not reap the profit windfall they had enjoyed the year before when the dollar plummeted, they still fared better than their European rivals. Among Europe's profitable operations, U.S. firms dominate—Apple Computer Inc., Compaq Computer Corp. Digital Equipment Corp., Hewlett-Packard Co. and IBM were profitable in Europe last year.

Still, for all hardware vendors there was little to crow about in 1991. Revenue from the European 25 large-scale systems vendors grew only 7%, compared with the previous year's growth of 12.5%. Midrange systems plummeted 31.3% in 1991 compared with a 1990 loss of 1.5%. This drop, however, includes the significant loss of NV

Philips' GL and Mannesmann Kienzle GmbH from the DATAMATION list, due to the acquisition of their IT businesses by Digital Equipment Corp.

According to IDC, revenue from large and midrange systems fell 9% and 4% respectively for the whole industry. UNIX vendors were the only victors in the battle for European hardware contracts. Last year the UNIX market grew 10% to \$9 billion, according to market research firm Dataquest Europe SA in Paris.

However, cutthroat competition, which drove prices and profit margins down sharply, made this victory Pyrrhic. For instance, although ICL grew its UNIX revenue 37% to garner 2.6% of the market, ICL cited low margins for these products as the biggest reason for its 41% profit plunge.

Even the market for personal computers was lackluster compared with previous years. The trend of replacing larger computers with PCs and workstations continued last year, but a combination of slower-than-expected growth in demand and overproduction sent prices toppling. Since companies discounted PC and workstation prices

between 20 and 40% early in product life cycles, the European market grew only 3% by value, according to IDC. DATAMATION's European 25 companies lost 25% in PC revenue in 1991, again due in part to the loss of vendors from our list.

With the single market in sight, Europe's big corporations continued their scramble to implement enterprisewide corporate networks. This trend contributed to the relatively healthy 5% rise in sales of data communication hardware, according to IDC. In addition, several telecommunications firms, including BT PLC and Sprint International, entered the European market for value-added network services.

The software industry in Europe fared better than the hardware industry, growing 12% last year, according to IDC. The DATAMATION European 25 firms increased their software revenue by a total of 20.5%. Nevertheless, many firms reported a slowdown in demand for systems integration, applications software and consulting. In addition, development tools that make it possible to reuse a high proportion of code even

The DATAMATION European 25 By Technology

	COMPANY	1991 IS REVENUE	MAIN- FRAME	MID- RANGE	PCs	WORK- STATIONS	SOFT- WARE	PERI- PHERALS	DATA- COM	SERVICES	MAINTENANCE	OTHER
1	Siemens Nixdorf	7,308.6	964.4	934.3	602.8	211.0	964.4	1,733.0	150.7	301.4	1,448.6	
2	Olivetti	6,050.8	115.6	478.6	1,586.1		630.8	1,018.6	164.1		1,094.5	962.5
3	Groupe Bull	5,929.8	830.2	355.6	889.5		593.0	1,067.4		415.1	1,363.9	415.1
4	ICL	3,308.1	582.0	268.8	297.4	191.0	625.6			213.9	752.2	377.2
5	Cap Gemini	1,776.3					284.2			1,492.1		
6	Memorex	1,533.1			207.6	44.3	3.7	888.2			389.3	
7	Finsiel	1,015.6					609.4			406.2		
8	BT	823.6							391.5	432.1		
9	Compaq	752.3	285.9					346.0			120.4	
10	Racal	679.0							679.0			
11	Sema Group	640.5					640.5					
12	Silgos	569.3			85.4		56.9			427.0		
13	SD-Scicon	472.7					47.7			425.0		
14	Getronics	442.5			26.6	17.6		88.5	35.4	141.6	132.8	
15	Software AG	429.2					153.7			170.0	105.5	
16	SAP	426.2					426.2					
17	GSI	422.8					101.5		321.3			
18	Logica	348.9	7.1	12.3	3.5	3.5	215.3			72.3		34.9
19	Dowty	340.4							340.4			
20	CGI	315.6					142.4			165.7		7.5
21	Amstrad	313.4			271.6		13.3	17.6			10.9	
22	Reuters	284.5								284.5		
23	Origin	283.4								283.4		
24	Norsk Data	282.0		140.3	14.2		22.7			104.8		
25	Tulip	215.5			215.5							

All revenue figures are in \$ millions

OVERVIEW

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on big custom projects such as airline reservation systems have contributed to an erosion in profit margins for software firms.

Overall, software firms accustomed to far higher rates of growth were caught unawares, says Michel Berty, general secretary at software and services firm Cap Gemini Sogeti in Paris, which reported sharply lower growth in revenue and profits. "For the first time, the crisis in the general economy reached us," he says. A general pessimism connected with the recession made customers reluctant to go ahead with large projects says Berty. In addition, declining hardware prices put downward pressure on software prices, vendors say.

The good news, however, is that cash-strapped users looking to shed overhead turned in droves to outside software and services firms to install and maintain their internal networks and data centers. Firms such as Cap Gemini and Electronic Data Systems Corp. reported a surge in demand for facilities management.

There is little indication that the IT

Foreign Exchange

Values of foreign currency (equivalent to one U.S. dollar) used in this year's DTM100*.

Denmark	Kr6.398
Finland	Mk4.043
France	Fr5.641
Germany	DM1.659
Italy	L1241
Netherlands	G1.87
Norway	Nkr6.428
United Kingdom	£0.567

* OECD average exchange rates

industry will be rescued by any drastic recovery. Indeed, the effects of the single market have been mixed. Whereas it has stimulated the market for international networks and communications, it may also have contributed to the severity of the recession.

The main problem has been strong growth in Germany's economy due to the effects of reunification, which has stimulated inflation and kept German interest rates high. Since the European currencies are linked, Germany's neighbors have been forced

to keep their interest rates high as well, increasing the cost of cash that firms borrow to invest in capital expenditures, including IT equipment. This year, however, Germany's economy is expected to go into recession. If so, the Bundesbank may relax interest rates, which have already come down from their peaks of a year or so ago. Elsewhere, modest recoveries are expected in Britain, France, Italy and Scandinavia.

Even with a potential German recession, IDC predicts that Europe's IT industry will grow an average of about 5% a year for the next two years—slightly faster than Europe's average Gross National Product. However, 90% of that growth is expected to come from software and services, favoring mostly smaller companies.

Sadly, Europe's IT industry is facing an uphill climb. Says Peter Bonfield, chairman and CEO of ICL: "This will be another difficult year. Earnings will be under pressure. Everybody's going for what little business there is. So far in Europe, nothing much is happening."

The Top 25 Suppliers Into Europe

RANK				1991 EUR. IS	1990 EUR. IS	%	TOTAL REV.		%	EUR. % OF	%
'91	'90	COMPANY	COUNTRY	REVENUE	REVENUE	CHANGE	1991	1990	CHANGE	TOTAL	CHANGE
1	1	IBM	United States	25,136.0	26,836.0	-6.3%	62,840.0	67,090.0	-6.3%	40.0%	0.0%
2	2	Siemens Nixdorf	Germany	6,943.2	6,889.2*	0.8%	7,308.6	7,654.7*	-4.5%	95.0%	5.0%
3	3	Digital	United States	6,549.4	5,490.4	19.3%	14,237.8	13,072.3	8.9%	46.0%	4.0%
4	4	Olivetti	Italy	5,082.6	5,324.1	-4.5%	6,050.8	6,414.5	-5.7%	84.0%	1.0%
5	5	Groupe Bull	France	4,269.5	4,508.2	-5.3%	5,929.8	6,349.6	-6.6%	72.0%	1.0%
6	6	Hewlett-Packard	United States	3,968.6	3,615.5*	9.8%	10,726.0	9,514.5*	12.7%	37.0%	-1.0%
7	—	Fujitsu	Japan	2,899.6	1,483.4*	95.5%	19,330.9	12,361.5	56.4%	15.0%	3.0%
8	9	ICL	United Kingdom	2,845.0	2,290.3	24.2%	3,308.1	2,862.9	15.6%	86.0%	6.0%
9	7	Unisys	United States	2,400.0	2,883.8	-16.8%	8,000.0	9,302.0	-14.0%	30.0%	-1.0%
10	12	Apple	United States	1,883.8	1,607.2	17.2%	6,496.0	5,740.0	13.2%	29.0%	1.0%
11	11	Compaq	United States	1,635.7	1,691.1	-3.3%	3,271.4	3,598.0	-9.1%	50.0%	3.0%
12	—	AT&T	United States	1,470.4	261.0	463.4%	8,169.0	2,900.0	181.7%	18.0%	9.0%
13	14	Canon	Japan	1,087.9	1,171.6*	-7.1%	3,751.5	4,040.1	-7.1%	29.0%	0.0%
14	19	Sun	United States	1,036.4	828.9	25.0%	3,454.7	2,762.8	25.0%	30.0%	0.0%
15	18	Finsiel	Italy	1,015.6	816.7*	24.3%	1,015.6	816.7*	24.3%	100.0%	0.0%
16	17	Xerox	United States	966.9	980.0	-1.3%	2,930.0	2,800.0	4.6%	33.0%	-2.0%
17	23	Commodore	United States	903.5	746.8	21.0%	1,038.5	995.7	4.3%	87.0%	12.0%
18	—	Andersen Consulting	United States	881.4	639.2*	37.9%	2,260.0	1,880.0	20.2%	39.0%	5.0%
19	22	Wang	United States	698.4	756.2	-7.6%	1,940.0	2,363.0	-17.9%	36.0%	4.0%
20	—	Prime	United States	691.2	476.7	45.0%	1,382.4	1,589.0	-13.0%	50.0%	20.0%
21	—	Microsoft	United States	682.8	444.0	53.8%	2,275.9	1,480.0	53.8%	30.0%	0.0%
22	24	Compax	Germany	677.0	654.9	3.4%	752.3	689.4	9.1%	90.0%	-5.0%
23	20	Memorex Telex	Netherlands	659.2	681.7*	-3.3%	1,533.1	1,634.9*	-6.2%	43.0%	1.3%
24	—	Sema Group	United Kingdom	627.7	522.7	20.1%	640.5	533.4	20.1%	98.0%	0.0%
25	25	Tandem	United States	618.5	618.1	0.1%	1,932.9	1,873.1	3.2%	32.0%	-1.0%

* Restated figure
All revenue figures are in \$ millions

OVERVIEW

SNI's Wiedig:

The Strategy Is Right

Dr. Hans-Dieter Wiedig, president and chief executive of SNI, discusses why he believes the Siemens-Nixdorf merger, despite its current problems, is working.

Siemens Nixdorf Informations-systeme AG's first full year as a new company was one full of organizational and financial challenges. At the helm, guiding the company through the tumultuous months of 1991, was chief executive officer Hans-Dieter Wiedig. Wiedig met recently in Germany with DATAMATION editor-in-chief David R. Brousell, international editor Elaine Appleton and European contributing editor Fred Guterl to examine the current state of Europe's largest indigenous supplier.

Q: Certain assumptions were made as the basis for the merger with Nixdorf, such as economies of scale, to be more competitive and to be able to stand outside the German market. Looking back now, have you verified the assumptions? Are the concepts still right?

A: I think they are right. Siemens concentrated on the mainframe business and also started a UNIX business in Europe and were relatively successful with marketing that. Nixdorf had solutions in the small- and medium-sized companies where Siemens wasn't well represented and only had a very small market share.

When the [opportunity] with Nixdorf arose, we asked ourselves "should we take it or not?" It would have been better to say this



earlier—two or three years ago—because the economic conditions at Nixdorf had been better. However, you can't choose this, you have to take it or leave it. That's the reality. But it's always a strategic consideration as to whether it is the right move.

That move was, and is, a very difficult one, that's true. It was more difficult than we expected. But here is the strategic point. We now have a business from mainframes right through to point-of-sale terminals. We now have Nixdorf point-of-sale customers that have subsequently installed mainframes. Siemens had mainframe customers that have now installed banking solutions from the Nixdorf side. It

has worked, but not as quickly as we had hoped.

Q: When the merger with Nixdorf first took place the idea was to create a new organization, a new culture in SNI. But now that Siemens has acquired the entire company, is this a contradiction?

A: I don't think so. The intention is to have 100% backing for SNI from Siemens, but keeping SNI as a company with its own identity. Although 100% of the shares are owned by Siemens, SNI remains a company in its own right, and this is very important. If you look at our competitors—which I always call universalists—none of them are stand-alone entities; they are all in combination with other companies and with other technologies....

NCR has joined with AT&T; IBM is trying to get partners to make it bigger. So the new trends in the industry help universalists. Why? Because modern technology in data processing is going away from islands of automation in a company. Now we have the opportunity to make data processing a comprehensive system going through the whole company, the whole organization. I call it the nervous system....

But it's very difficult for companies to do this, and that is the major idea, in my opinion, behind this new structure in the data-processing

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industry and why the closer affiliation with Siemens makes sense.

Q: SNI's first year was a tough one financially, partly because you attempted to combine Siemens and Nixdorf as a recession occurred. But if you could strip away the restructuring costs, what would the financial picture be with regard to the losses? What percentage of the losses would have nothing to do with the merger?

A: Yes, I will try. I want to emphasize this: the whole industry is in a very difficult situation, and it has been the most difficult year this industry ever experienced. If you look to the results, most of the companies have red figures without any merger. If I were to comment on what part of the losses last year were due to the merger, and, on the other hand, due to the business conditions, then I would say about half and half.

Q: What's your reading about the mood, the level of confidence within the customer base at this time?

A: The backing from Siemens was very important. Now also our customers are quite sure SNI will not disappear because of problems particularly from the merger and from the whole industry situation as well.

Q: How have you felt personally throughout this time period with the merger? Are you maintaining your patience or have you gotten angry or impatient with the pace of improvement?

A: I went through all these stages you've described. You get angry and you get frustrated and so on, and you increase pressure. But you come to realize that if you increase pressure just one percent more, the system will fall down. So you can only solve a certain amount of problems within a certain time. The question is not whether you have the strategic solution in your head, which we believe we do, the problem is to have it fulfilled through an organization. ■



IS Revenue **\$7.31 Billion**

EUROPE **EUROPE**

SIEMENS NIXDORF
INFORMATIONSSYSTEME AG

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The financial performance of Siemens Nixdorf Informationssysteme AG was a huge disappointment last year. Depressed sales following the abrupt merger of Nixdorf Computer AG and Siemens AG's computer division in October 1990 led to a hemorrhaging of red ink. SNI lost DM781 million (\$471 million) on DM12.1 billion (\$7.31 billion) in revenue for 1991.

Company officials attribute half of the loss to higher than expected restructuring costs and the other half to the recession. Expected personnel savings were slow to materialize, the company says, due to delays in redeploying staff. Negotiations with so-called works councils—German law gives unions a say in management for a number of months after the merger—eventually led to the layoff of 3,000 employees. Yet, the consolidations weren't fast enough or deep enough to stanch the losses. Company officials had expected to come close to breaking even in 1991, but that milestone may not be reached for years. Those officials now hope to halve the loss in 1992. However, analysts say the cost reductions to date are inadequate.

"Three thousand people is not nearly enough," contends Susan Anthony, an analyst at Robert Fleming Securities Ltd. in London. "Nixdorf itself was horribly overmanned, and if you put together two companies with strong presences in the German market, you've got to have a great deal of overlap."

President and chief executive officer Hans-Dieter Wiedig is under pressure to turn SNI around. Last

year, Siemens AG spent more than DM787 million (\$474 million) to acquire the remaining SNI shares it didn't already own to bolster the ailing firm.

SNI officials say things are under control, but they acknowledge that they underestimated the challenges of integration. It took 16 months to patch together the two companies' computerized order-processing networks. "There are 200 different internal applications within the two companies," says Wiedig. "You can't imagine what has to be done to harmonize them. It is very difficult."

The network integration trouble underscores some of the problems SNI has had to contend with in rationalizing its proprietary Nixdorf and Siemens products, as well as their UNIX lines. However, SNI expanded its offering of UNIX products in 1991 by introducing a line of reduced instruction set computing (RISC) servers based on the R4000 processor from Mips Computer Systems Inc. It also introduced software designed to be portable from Nixdorf's midrange systems to its UNIX platforms. However, its extensive migration plan to wean customers away from proprietary products to UNIX-based systems has met so far with lackluster response.

Indeed, many customers are not happy with SNI. Some complain it is too bureaucratic, reflecting Siemens's lethargic personality. "Nixdorf was a small, responsive company," says a German data-processing manager and original Nixdorf customer. "SNI now is just like IBM—too many people and too much bureaucracy." In response, Wiedig asserts that SNI remains committed to preserving the innovative culture that made Nixdorf so successful in the early and mid-1980s.

Wiedig points to a 23% increase in orders in the first five months of the new fiscal year as cause for hope. In addition, he's reduced production and instituted other cost-saving measures. However, analysts say SNI

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should move faster. "It's terrifying that it isn't doing anything more urgently," says analyst Anthony.

—Frederick V. Guterl



IS Revenue \$6.05 Billion

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Ing. C. Olivetti & Co. SpA paid the price for a misguided strategy, stubborn costs and some indifferent products last year. The company reported a net loss after five years of declining earnings. The dramatic bank fraud conviction of Olivetti's high-profile chairman Carlo De Benedetti in early 1992 further dimmed the company's image as one of Europe's high-technology stars and overshadowed both its rescue plan and a raft of new product introductions.

Declining revenue, tighter margins and a drastic restructuring led Italy's largest IS company to report its first net loss, L450 billion (\$326.6 million), since chairman De Benedetti took control in 1978. IS revenue dropped 5.7% in 1991 to \$6.05 billion (L7.5 trillion). The loss was inflated by the inclusion of part of the restructuring costs for 1992, which covered the closure of a facility and the elimination of 1,500 workers. Olivetti shed 7,200 employees last year, 13% of its work force.

"Olivetti has had a tough time, but then so has everyone. It has cut out the fleshy parts of the business, and the priority now is to control its cost base," says Chris Fell, an analyst with Dataquest Europe Ltd. of Denham, U.K. IS managers say that Olivetti's troubles, and De Benedetti's, won't dissuade them from further purchases. For example, Peter Van Hees, IS manager with Dutch bank Rabobank

Nederland, continued a seven-year contract worth more than \$400 million with Olivetti last April, "knowing that they were going to report a loss," says Van Hees. As for the conviction, he states: "If he goes to prison, I don't think it would be the death of the company."

The financial crisis led De Benedetti, who controls around 44% of the company's voting shares, to return to day-to-day management after almost a decade away from the scene. He ousted Vittorio Cassoni as chief executive officer and reorganized the company to reduce costs and increase effectiveness.

De Benedetti reunited the two main Olivetti operating units. One unit had sold commodity type office products and low-end PCs while the other pushed PCs and big-ticket systems to corporate clients. Elserino Piol, who was chief executive officer of the systems unit and is now chief operating officer and De Benedetti's second in command, acknowledges that the divided structure hampered PC sales, the single largest source of revenue for Olivetti.

In systems, Olivetti introduced two new UNIX-based minicomputer families: the Intel-based LSX 5000 line and the LSX 6500 line of high-end reduced instruction set computing (RISC) systems. The latter machines are sourced from Pyramid Technology Corp., but Olivetti will introduce its own high-end line, the LSX 6000, using the R4000 processor from Mips Computer Systems Inc.

Last year's sales of the LSX 5000 line were disappointing. Piol says that the LSX 5000 did not ship until midyear and claims that customers are waiting longer than they used to before buying new systems. Lengthening selling cycles also hit sales of IBISys, Olivetti's office information system software, introduced last year. The Gartner Group Inc. of Stamford, Conn., notes that the company's reach seems to exceed its grasp. Gartner suggests that its experience in selling systems does not

match the breadth of its current system offering. —Geoff Nairn



IS Revenue \$5.93 Billion

COMPAGNIE DES MACHINES BULL
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Unlike many computer companies that were sailing along fine when the economic skies began to darken in 1991, Paris-based computer giant Compagnie des Machines Bull was already at a financial nadir. Digesting its acquisition of Zenith Data Systems and the outstanding shares of Bull HN Information Systems Inc., its U.S.-based venture with Honeywell Inc., had contributed to a monumental Fr6.79 billion (\$1.25 billion) loss in 1990. "We were more vulnerable than most of our competitors to the recession," admits Francis Lorentz, Bull's chairman and chief executive officer.

Against the dismal financial backdrop of 1990, Bull's Fr3.3 billion (\$585 million) loss in 1991 looks like good news. Revenue was down 6.6% over the previous year's restated level of \$6.35 billion (Fr34.6 billion) to \$5.93 billion (Fr33.5 billion). Indeed, despite its myriad financial problems, Bull found its fortunes in 1991 to be relatively upbeat. For one thing, most of the anticipated Fr4.5 billion (\$826.3 million) cost of restructuring was absorbed in 1990, clearing the slate for a fresh start last year. New alliances with IBM and NEC Corp. and Fr2 billion (\$354.5 million) from the French government secured much needed investment for Bull to round out its product line.

Perhaps the most urgent task facing Bull's managers in recent years has been to catch up with the rising wave of UNIX and open systems sales,

EUROPEAN COMPANIES

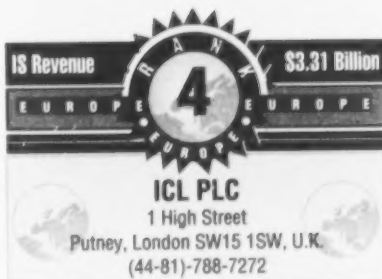
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which currently account for only 10% of Bull's revenue. Significant progress was made earlier this year. Although Bull has been expanding its UNIX line, its strong 46% growth in UNIX products was nonetheless hampered last year due to a long-delayed reduced instruction set computing (RISC)-based server. After a heated competition between RISC chip sets from Hewlett-Packard Co. and IBM, the uncertainty ended when a deal was finally struck between Big Blue and Bull in February 1992. IBM also bought a 5% stake in Bull for roughly \$100 million. Bull's RISC servers and workstations began shipping several months ago. "This will put an end to a difficult time during which we had no clear message for our customers about our RISC strategy," says Lorentz.

The key to Bull's UNIX strategy is ensuring a smooth transition to open systems for the 90% of its sales dependent on the disparate mix of proprietary mainframe and midrange computer products left over from the Bull-Honeywell-NEC Corp. partnership. Bull's Distributed Computing Model, a comprehensive architecture based on open standards interfaces designed to link these different systems, won numerous plaudits last year. With this modular approach, clients can gradually migrate to an open computing environment. "Bull's UNIX strategy is starting to pay off," says analyst Dedene Nelson of the Paris office of market research firm Dataquest Inc.

Bull's corporate strategy began to become clear last year, as well. Lorentz is trying to turn his company toward the more profitable software and services businesses and buttress his hardware lines through a network of alliances. The RISC chip deal with IBM is part of a web of arrangements between Bull, France Telecom, NEC and other companies that include an exchange of equity and a sharing of research, technology and products, while at the same time keeping Bull's roots firmly in French soil. More deals are forthcoming.—*Frederick V. Guterl*



ICL PLC managed to make it through the past difficult year in better financial shape than most of its competitors. Revenue increased 15.6% to \$3.31 billion (£1.88 billion), the bottom line was in the black and the company gained market share in the United Kingdom, its largest market.

However, ICL's profit of \$72.8 million (£41.3 million) was down 41% from 1990, and the revenue figure includes contributions from several acquisitions, most notably the data systems division of Nokia Group of Finland and two software and service companies, The CFM Group of the United Kingdom and Systems House Comdes BV of the Netherlands. Revenue growth from ICL's traditional mainframe and midrange businesses was largely flat last year.

In the late 1980s, ICL moved earlier than most to embrace UNIX and open systems in its product strategy. Yet these products, which now account for the lion's share of ICL's hardware sales, are not particularly profitable. Despite success in the marketplace—sales of UNIX products grew 28%, and sales of personal computers grew 26% last year, excluding the effects of acquisitions—the low profit margins for these products were the main cause of ICL's 30% fall in operating income, according to chairman and chief executive officer Peter Bonfield.

Even so, last year ICL continued to introduce open standards to its products, most notably with its VME mainframe operating system, the first in the industry to comply with X/OPEN Co. Ltd.'s XPG3 portability guide. Open VME may help ICL win contracts such as its recent £200 million (\$353 million) deal with British

Gas PLC, in which the company beat out IBM. However, it may also erode the company's mainframe revenue.

"On the one hand, you get quite a good marketing story. But on the other hand, you know you're going to get into more of a business problem—much more competition, lower margins on the hardware," Bonfield says.

"You just grit your teeth and say, 'Yup, that's dead right, now what do we do?' We've got to add value with consultancy and services and make damn sure the costs for hardware development are optimized."

Although Bonfield insists that Fujitsu Ltd., which took an 80% stake in ICL in November 1990, does not interfere in the day-to-day affairs of the company, the backing of the Japanese electronics giant has eliminated the precarious financial image ICL once had among its European competitors and customers. Bonfield says ICL is on course for a public flotation of 25% of its shares within the next three years, which would leave Fujitsu with 75% and would divest Northern Telecom Ltd. of its current 20% holding. "If we show the market that we can get into growth areas, we'll go onto the stock market," says Bonfield. Analysts are sanguine as well. "ICL has shown yet again that they are one of the best-performing companies in the industry," says Charles Burrows of the London investment firm James Capel & Co. —*Frederick V. Guterl*



A year ago, executives at Cap Gemini Sogeti were confident that the company had seen the worst of the recess-

sion; the Gulf War had ended, and the industry appeared poised for another year of spectacular growth.

However, things turned out differently. For the first time since its creation in 1975, Cap Gemini had to weather a sharp slowdown in the normally recession-proof software and services industry in 1991. Revenue was up a mere 5.4% to \$1.78 billion (Fr10.02 billion)—far short of chairman and chief executive officer Serge Kampf's previously stated goal of 30% average yearly growth. Meanwhile, net earnings dropped 12% to \$99.3 million (Fr560 million). The company's poor performance "came as a shock," says general secretary Michel Berty.

The slowdown came just as Cap Gemini was laying the foundation of its attempt to become a worldwide software and services powerhouse, doing everything from consulting and software development to systems integration and facilities management. In recent years, Cap Gemini reinforced its leadership role as Europe's biggest software and services firm through acquisitions and alliances. Cap Gemini made its biggest deal last year in a merger with Debis System Haus, the computer services arm of German car maker Daimler-Benz AG. In addition, it acquired smaller computer services firms, such as Scandinavian firm Programator in January 1992. Cap Gemini also arranged a joint venture with Volmac Software Groep NV, a leading Dutch computer services company.

Along with its 1990 acquisition of the British software firm Hoskyns Group PLC, Cap Gemini has established a strong European presence. Next year, company executives plan to turn their attention to markets where the Cap Gemini presence is weak—namely, the United States and some of the smaller European countries, such as Spain. Cap Gemini is on the lookout for more acquisitions in the United States, but Berty expects the agreement with Daimler to boost organic growth, as well. The agreement gives the German firm an option

to acquire a majority stake in Cap Gemini in 1994 providing Cap Gemini gives its consent. "The Daimler deal hasn't helped us yet in the U.S.," he says, "but it will eventually, because of the name recognition."

Nevertheless, the slowdown has forced Cap Gemini to rethink its methods of working with customers, at least for the time being. In particular, customers have shown a marked desire to cut costs by only commissioning smaller projects likely to produce fast returns. The shift to short-term results has made the big—and more profitable—contracts more difficult to find. "Instead of developing large systems over a long period of time, we've had to be more modest and react more quickly to our customers' problems," says Berty.

When the fog of recession finally lifts, industry observers expect Cap Gemini to continue its sharp upward growth trend. "Cap Gemini and Debis are both very successful companies in their own right," says Amit Chaudhuri, an analyst at International Data Corp. in London. "Together they are a very powerful combination."—*Frederick V. Guterl*

Bankruptcy Act to facilitate the company's revamping.

The momentary visit to bankruptcy court was designed to break the vicious circle of shrinking revenues and crushing interest payments on \$1.6 billion in junk bonds, which have led to ever-growing net losses. Declining sales in the company's core businesses, terminals and storage products, plus the ending of an original equipment manufacturer (OEM) contract supplying disk drives for IBM's AS/400 minicomputers, cut IS revenue by 6.2% to \$1.53 billion last year. The net loss jumped from \$68.9 million in 1990 to \$386 million due to the debt. (Memorex Telex's revenue is reported in dollars and was restated downward from \$1.95 billion to \$1.6 billion.) The company's work force was slashed by 19% to 7,600.

A rescue plan, concluded in early 1992, converted half of Memorex Telex's bonds into equity and transformed the once-privately held concern into a public company quoted on the NASDAQ stock exchange in the United States. "We hate the fact that we had to enter into Chapter 11, even if it was only for six weeks, because everyone thinks we went bankrupt," laments Giorgio Ronchi, chairman and chief executive officer of Memorex Telex.

Despite its net loss in 1991, the company was profitable on an operating basis, Ronchi notes, and the restructuring plan predicts a gradual rebound in performance, with operating income this year just covering interest expenses. However, SoundView Financial Group Inc. of Stamford, Conn., is less optimistic, predicting a \$45 million pretax loss for the current fiscal year which ends in March.

Most of Memorex Telex's business still comes from IBM 3270-compatible terminals and controllers, although that business is declining 5% to 10% per year as customers increasingly replace dumb terminals with networked PCs, which Memorex Telex also supplies. Its combined revenue



Faced with mounting losses and falling revenue, Memorex Telex NV finally gave up struggling under its massive debt burden and agreed to restructure under prepackaged Chapter 11 protection. Memorex Telex's managers, owners and creditors prearranged a restructuring and recapitalization plan prior to filing a petition under the U.S. Federal

from dumb terminals and networked PCs dropped 9% in the last fiscal year to \$817 million and is predicted by SoundView Financial to remain virtually flat during the next two fiscal years.

Storage products—mostly tape and disk subsystems from Fujitsu Ltd. for IBM mainframes—generate about 16% of the company's revenue. While this business has been shrinking, with revenue dropping 7% in the past year, it offers the best growth prospects among the company's product lines, according to SoundView. The securities firm predicts around 13% growth for Memorex Telex's storage products in the current fiscal year. The company plans to broaden its line of robot tape cartridge libraries to better compete with market leader Storage Technology Corp. of Louisville, Colo.

The restructuring has been received favorably by customers, but Memorex Telex may face more perils in the future. If the pretax losses occur and persist, says SoundView, the company's substantial sales and customer support operations could make it an acquisition target.—*Geoff Nairn*



The most significant event in 1991 for Finsiel SpA (Finanziaria per i Sistemi Informativi Elettronici), Italy's largest software and services company, was a government-backed proposal to merge the state-controlled company with the software arm of Ing. C. Olivetti & Co. SpA, its private sector rival.

The marriage didn't happen, and neither party shed many tears, but the proposal put a question mark over the

future of Finsiel, which relies on the government for most of its revenue. Of Finsiel's 1991 IS revenue of \$1.02 billion (L1.26 trillion), up 24.3% from the previous year, two-thirds came from central and local government contracts. Net earnings in 1991 rose almost 8.2% to \$24 million (L29.5 billion).

"Our position in the public sector is strong, but not dominant," says Pier Paolo Davoli, chief executive officer of Finsiel. He claims that Finsiel supplies only a third of the total software and services of the Italian government, leaving plenty of room for competitors.

The European Court thinks otherwise. It ordered the suspension of a gigantic contract to computerize the national lottery awarded in 1991 to the Lottomatica consortium, led by Finsiel and a state-owned bank, Banca Nazionale del Lavoro, each of which has a 25.5% stake in the deal. The contract is worth more than L2.5 trillion (\$2 billion) over its 10-year life.

The tendering procedure for this contract, as with many Italian public sector contracts, required bidders to be majority-owned by the Italian government. This requirement favored the Lottomatica consortium and thus contravened European Community rules on competition.

To further its nongovernmental business, in 1991 Finsiel began to regroup the 19 companies it controls to focus on specific industrial sectors. The reorganization will be completed this year. One group, under the provisional name of Banksiel, aims to raise the profile of Finsiel's various banking software activities, which accounted for about 15% of the company's revenue in 1991.

Revenue from this financial sector grew 50% in 1991, following the completed acquisition of two Italian banking software houses—Finsiel's first acquisitions. Davoli predicts growth in this sector to settle this year to 20%, similar to the rate of revenue growth for Finsiel's more traditional government contracts.

One of the more immediate prob-

lems facing Finsiel is its weak capital base, which is holding back the company's expansion and preventing further acquisitions, says Davoli.

In 1991, Finsiel's two state-owned shareholders—the industrial holding corporation Istituto per la Ricostruzione Industriale, with an 87% stake, and the Banka d'Italia, with a 13% share—subscribed to a stock offering that doubled Finsiel's capital to L100 billion (\$80 million).

—*Geoff Nairn*



It was another chaotic year for BT PLC, formerly British Telecom.

The telecommunications monolith struggled with questions about privatization, dealt with a continuing deep recession in the U.K. economy, axed thousands of jobs—and through it all, garnered generous profits.

For the calendar year, revenues increased 2.3% to \$23.5 billion (£13.3 billion), but profits shot up 19.5% to \$3.73 billion (£2.1 billion). Chairman Iain Vallance used these results to justify a notorious 12.5% pay raise to £450,000 (\$793,650).

BT's profits haven't made the company popular with domestic customers, however. Indeed, Oftel, the U.K. telecom industry regulator, constantly threatened to take BT to task for its domestic and overseas prices and for alleged monopolistic practices.

Adding more spice to the past year was the general-election campaign, in which the opposition Labour party promised to renationalize the country's telephone backbone network. Such a

move would have left the privately held remainder of BT to carry on the company's mission of becoming the world's leading value-added voice/data services provider. But the Conservative victory relieved BT's anxiety; the whole of BT will remain private for the foreseeable future.

Revenue from international services rose by a disappointingly slim £22 million (\$38.8 million) to £1.8 billion (\$3.2 billion). There were further letdowns as BT failed to sign up major telecom operators Nippon Telegraph and Telephone and Deutsche Bundespost Telekom to provide worldwide services via its Syncordia joint venture, a new business that BT says will provide global network management to private customers. Without the support of the Japanese and German telecom providers, Syncordia has been unable to get off the ground.

Revenue from providing equipment directly to customers fell by £40 million (\$70.5 million) to £1.34 billion (\$2.36 billion), a figure likely to decrease further as BT continues to rid itself of all non-service businesses. However, BT has yet to sell its 51% stake in Canadian telephone switch maker Mitel Corp. nearly two years after saying it would do so.

The company has successfully sold off other units, however, including its Micronet on-line PC information service, with 12,000 users, to U.S.-based Compuserve Inc.

BT is also having to shell out millions for the costs of reducing staff. The company, which had slashed its work force by 15,000 in 1990, is cutting as many as 30,000 or more employees from its present roster of 200,000. BT claims that internal automation has decreased its staffing needs.

A growing number of potential competitors to BT's corporate business emerged last year. Large U.S. operator Sprint International entered the European market for long-distance services. The home-grown National Network also poses new

competition; the London-based company uses the Post Office's internal network to bring telecom services to domestic users and to bring transatlantic service to the United States and Canada.—Jon Kaye

IS Revenue **\$752.3 Million**

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Rather than buckle under the pressure of declining computer investment in its domestic market and a hesitant recovery in Eastern Europe, Comparex Informationssysteme GmbH began what chairman and chief executive officer Rolf Brillinger calls a "new era" in 1991 as Europe's leading plug-compatible manufacturer.

Comparex, which mainly distributes Hitachi Ltd. products, gained its independence from shareholder Siemens AG in 1991 after Siemens sold its 33.5% stake to the Ludwigshafen, Germany-based chemical giant BASF AG, which previously held 66.5% of the company. The five-year marriage ended with mutual relief. Siemens was free to concentrate on stemming its losses after the merger of its IS operations with Nixdorf Computer AG, and Comparex was able to focus more attention on areas such as laser printers, which formerly suffered from indirect but damaging competition with Siemens.

Comparex was able to weather what Brillinger calls a "relatively gloomy year for the industry as a whole" better than most. The company, which includes eight subsidiaries and a number of distributors throughout the world, reported con-

solidated revenue of \$752 million (DM1.248 billion), an increase of around 9.1% over 1990's level.

Domestic revenue in 1991 was up 9% to \$370.1 million (DM614 million). Exports climbed 15% to \$382.2 million (DM634 million). Revenue from peripheral systems, roughly 46% of total Comparex sales, rose 8% to \$346 million (DM574 million). About 35% of all revenue last year was generated by the growing rental business, which provides a steady stream of profit.

However, the company's net earnings declined 30.4% from 1990 to \$18.1 million (DM30 million), due to a number of factors. Heavy discounting by IBM forced massive price erosion in Comparex's major markets. Furthermore, the company made strategic investments in developing systems and expertise to pave the way for its entry into the world of open systems and new technologies such as redundant arrays of inexpensive disks (RAID) storage devices. Comparex also experienced rising costs due to the support of new operations in Eastern Europe.

The revenue gains were the result of strong demand for new products. Deliveries of the new 9/9XX high-end processors helped boost Comparex's mainframe revenues 19% to \$285.9 million (DM474 million), marking a return to 1989 levels, when high-end systems accounted for 39% of the company's total sales. Comparex is the only firm marketing Hitachi mainframes and peripherals in Eastern Europe, including the former East Germany.

By the end of 1991, Comparex had installed some 20 9/9XX systems throughout Europe and had announced the addition of two new high-end processors, the 9/950 and the 9/960, supplied by Hitachi. Comparex also introduced additional features for its 6388 automatic cartridge library system and new storage technology for the Unisys Corp. market.—Peggy Salz-Trautman



RACAL ELECTRONICS PLC
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(44-344)-481-222

Racal Electronics PLC set out to prove that it could grow a solid worldwide network products and services organization last year. Over the past several years, Racal has acquired a variety of companies that sold products ranging from local area network hardware to modems to wide area network services. By last year, its various businesses were scattered throughout 10 countries, operating under different names and with some redundant services. In August 1991, it consolidated under the Racal-Datcom Group moniker 15 separate data communications businesses, which now together offer global and domestic network services.

The Group pioneered a network architecture strategy, called Racal Strategic Architecture, designed to enable corporate network users to move from host-based to distributed computing through use of both public and private networks.

Its strategy seems to be paying off. The company estimates that its 1991 IS revenues, which include data communications systems and services and a smaller proportion from sales of electronic design automation software and data security products, grew 8.6% to \$679 million (£385 million). Earnings climbed 7.1% to \$220.3 million (£124.9 million).

In a rare joint marketing agreement, Racal-Datcom partnered with Atlanta-based telecommunications holding company BellSouth Corp. The two are providing end-to-end network systems for BellSouth Telecommunications Inc. customers, linking BellSouth's private line and switched data services with Racal's T1 multi-

plexers and other products.

Back on its home turf in the United Kingdom, the company continued servicing its Government Data Network, which is designed to link all government departments across the country. Although company officials say the GDN work is going smoothly, critics have said the network doesn't provide all of the functionality the government needs. Racal won't divulge the amount of the contract, but some analysts speculate its worth in the hundreds of millions of pounds.

Parent Racal Electronics PLC successfully fended off a protracted hostile takeover bid from Williams Holdings PLC last year, spinning off its lucrative cellular telephone business in the process. Racal Electronics distributed its 80% stake in Racal Telecom PLC, now called Vodafone Group PLC, to Racal Electronics shareholders last September. Previously, the profitable mobile telephone concern had had an extremely high market valuation and stock price, thus competing against its parent and skewing the market valuation of other parts of the company. Without Vodafone, Racal-Datcom and other portions of the conglomerate are valued more positively, analysts observe, making it more difficult for a hostile bidder to succeed.—*Jon Kaye*



SEMA GROUP PLC
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Sema Group PLC's revenue growth continued to outpace the industry, but its profitability again failed to increase last year. Sema's corporate revenue jumped 10% to \$727.5 million (£412.5 million) in 1991, but net earnings hardly budged, increasing only

1.1% to \$18.7 million (£10.6 million). As a consequence, Sema's profit margin declined significantly, to 2.6%. Boosting that percentage to 4 or 5% is a corporate priority for 1992, says chief executive officer Pierre Bonelli.

The more urgent hurdle for Sema to overcome is finding a partner to help market and fund development for the I-Line manufacturing software package it acquired with ADV/Orga F.A. Meyer AG of Wilhelmshaven, Germany, in 1990. The acquisition, which represented Bonelli's great hope for cracking the German industrial market, turned into something of a nightmare in 1991. First, the German economic locomotive stalled in the third quarter, causing sales of I-Line to falter; Sema's revenue in Germany grew only 0.4% in 1991. Second, the COBOL-based I-Line gobbled up about half of Sema's total internal research budget, or roughly \$7 million (\$12.3 million). A deal is expected this summer.

Profit at BAeSema Ltd., the company's U.K.-based joint defense venture with British Aerospace PLC, also dissolved into red ink in the last half of 1991. The loss, says Bonelli, was attributed to the costs of setting up the venture and not to any market problems like those the company faces in Germany. BAeSema, he adds, "should be profitable by the end of the year."

Analysts say Sema's outlook is clouded by external market pressures and by barriers to improving its profitability. "Sema actually has more technical expertise in certain markets, such as defense, energy and transport, than Cap Gemini Sogeti," says Morgan David, manager of the European software and services program for the Paris office of International Data Corp. He adds, however, that Sema faces the same profitability problems that have plagued other European software and services companies fighting over dwindling business in the defense and energy markets.

Bonelli says Sema's main strategy for 1992 is to increase its stature as a systems integrator and to grow internally. The company may acquire some minor

companies in France, Spain or the United Kingdom, he says, "even though I don't see too many interesting targets right now." Most of the firms available for acquisition are body shops, which provide no particular market expertise, he notes. —*Marsha W. Johnston*



Internationalization was the order of the day in 1991 for Sligos, one of France's largest software and systems-engineering houses. The subsidiary of France's largest bank, Credit Lyonnais, heightened its international profile with an aggressive acquisitions campaign. It got control of three companies: 51% interest in German banking systems company Hoell and British banking and financial systems company Nexus, as well as 100% of Spanish banking systems company O'Dati.

The purchase of Nexus was an important victory for Sligos after Britain's Mergers and Monopoly Commission rebuffed its earlier attempt to acquire a far larger monetary systems company called Signet, says Morgan David, manager of the European software and services program for the Paris office of market research firm International Data Corp.

Net income at Sligos rose 3.1% in 1991 to \$30.3 million (Fr170.7 million), as revenue rose 7.3% to \$569.3 million (Fr3.21 billion), in contrast to the 19.5% and 15% increases, respectively, of the previous year. The slower rate of growth can be attributed largely to a sluggish hardware resale market, according to David. Sligos is France's top-ranking reseller of PCs, according to IDC.

The company has already demonstrated that further global expansion will be its direction for 1992. In February of that year, Sligos acquired a 52% stake in Ikoss, a German systems-engineering company specializing in the banking and industrial sectors. Another German acquisition is in the works, according to Sligos president Gerard Bauvin. "We're negotiating with a company specializing in payments processing," he says. Bauvin expects international revenue to exceed 20% of the total revenue in 1992, double the level of last year.

"Sligos is one of the truly internationalizing French companies. It has not made any mistakes in acquisitions," says IDC's David. "It could well be one of the future global leaders from French industry."

At 33.6%, the percentage of Sligos's revenue from systems engineering last year surpassed that of banking and financial services (30.2%) for the first time, a turn of events, notes Bauvin, that was not anticipated by the company. In 1990, 28.5% of Sligos's revenue came from systems engineering, and 30.6% came from banking services. The company had forecast that systems engineering would make up only 29.7% of revenue in 1991 and that banking would drop to 30%. The shift was due entirely to the acquisition of so many new systems-engineering houses, according to a Sligos spokesperson.

—*Marsha W. Johnston*



The number of major U.K.-owned systems integrators shrank dramatically last August when Dallas out-

sourcer Electronic Data Systems Corp. bought SD-Scicon U.K. Ltd. for \$272 million.

SD-Scicon's wedding came less than a year after French systems house Cap Gemini Sogeti took over London systems integrator Hoskyns Group PLC, leaving only Logica PLC as a major independent U.K. player.

EDS has subsumed SD-Scicon's financial results within its own and does not disclose SD-Scicon figures, but DATAMATION estimates the company's revenues to be £268 million (\$472.7 million). This revenue level means the merged operation is the U.K.'s biggest single services provider, although its size pales beside EDS's \$7 billion-plus worldwide revenue.

That kind of financial backing and prestige should come as a welcome change for the U.K. systems house, which struggled financially in 1990 under the weight of poorly managed fixed-price government contracts. SD-Scicon can return to its core business of designing and implementing systems for government departments, defense operations and manufacturers, without having to look over its shoulder at its jittery bankers.

Operationally, EDS is treating SD-Scicon as an autonomous subsidiary. Functions such as staffing will remain squarely in SD-Scicon's realm. SD-Scicon officials in the U.K. have been reassuring customers that the company will continue to provide the same level and range of services that it did prior to the merger. Observers say most users are pleased that SD-Scicon—which had heavy losses in 1990—now has the backing of powerful EDS.

Military establishments continue to purchase services and software from the new EDS subsidiary, despite analysts' forecasts that such business would diminish as defense budgets shrink. SD-Scicon's XD-Ada compiler, in particular, continues to be favored by military establishments.

And SD-Scicon is making inroads with its neural network technology.

Numerous corporations and U.K. government departments are evaluating a neural net-based security system called Sentinel. The Home Office and the Department of Transport would employ Sentinel for traffic analysis on the roads and on London's Underground, respectively.

SD-Scicon also claims a big increase in the number of electronic data interchange (EDI) systems installed, particularly in its large base of manufacturing sites.—Jon Kaye



IS Revenue **14** **\$442.5 Million**

EUROPE

GETRONICS NV
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(31-20)-5861412

While other European information systems suppliers felt the ravages of recession, systems integrator Getronics NV of the Netherlands saw its 1991 sales and net income soar. Aided by an acquisition spree, revenue shot up 22% to \$442.5 million (G827.5 million) and net income rose 11.3% to \$28.5 million (G53.3 million). Getronics estimates that without the acquisitions, however, internal growth still amounted to 17% of the sales increase.

How did Getronics perform so well? It followed its customers' rapidly growing needs for software and services—particularly for network integration services, say analysts. The company is slowly attempting to change its mix of revenue-generating enterprises, decreasing maintenance and installation activity while increasing more profitable software services and consulting. In 1991, it derived 30% of its revenue from maintenance and installation, down from 36% in 1990; software services and consulting brought in 32% of revenue, up from 29% in 1990. The remaining 38% came

from hardware sales, including data communication equipment, PCs and workstations.

"Getronics has aggressive management that is on the ball with new technology and entering new markets. And they are not shy about ending any activity that is less profitable as the market changes," says Marc Sledebroek, an analyst with Keinwort Benson in London.

The perception of the company as a fair-minded systems integrator that doesn't favor the products of any particular hardware or software vendor has aided its bottom line. Says London-based analyst Dennis Exton of Merrill Lynch: "They are perceived as having no ax to grind," he says.

In order to keep up with the fast-growing market for network integration, Getronics last year expanded its telecommunications expertise. It bought mobile communications/industrial automation specialist Vanandel BV in order to expand its ability to design and deliver network systems. The company also purchased third-party network maintenance specialist Koning en Hartman BV. Also in 1991, Getronics bought disaster recovery specialist Computer Uitwijk Centrum BV in a bid to flesh out the range of services it supplies to its maintenance contract customers. It also acquired a German distributor of computer products.

It is too early to tell whether these acquisitions will pay off, says analyst Exton. But such expansion raises the question of whether Getronics has grown too big too fast, he adds.

One consequence of such rapid external growth was a fall in the average net profit margin to 6.5% in 1991, down from 7.1% in 1990. Getronics attributes the decline to the added expense of enforcing quality measures as the company increases its systems integration activities.

While the company implemented some ambitious plans last year, it refrained from the temptation to create a pan-European empire like that of Dutch competitor BSO/Origin

Technology In Business or Paris giant Cap Gemini Sogeti. Until clients demand pan-European services, say company officials, Getronics is content to stay close to its home markets of Benelux, Spain and Portugal.

—Barbara Benson



IS Revenue **15** **\$429.2 Million**

EUROPE

SOFTWARE AG
Uhlandstr 12
D-6100 Darmstadt
Germany

Software AG chalked up a solid financial performance last year, posting Worldwide Group revenues of \$429.2 million (DM712 million) in 1991, up 18.8% from 1990's level. As a privately held company, Software AG doesn't report net income, but it did say that 1991 represented its 22nd consecutive profitable year.

Software AG publicly reports its financial results in two ways. The Worldwide Group figure consists of revenues from the parent company and wholly owned subsidiaries, and product revenues of affiliates that Software AG doesn't own but that are exclusive to Software AG products.

The company also reports figures for the Worldwide Concern. Last year, the Concern recorded \$343.6 million (DM570 million) in sales, up 21% from 1990. The Worldwide Concern's revenue includes sales by the parent company as well as its wholly owned subsidiaries (the most prominent of which is Software AG of North America in Reston, Va.) and royalties from affiliates. Revenues generated in the United States and other locations outside Europe totaled \$112 million.

Pretax operating profit of the Worldwide Concern was about \$16 million in 1991. The decline from the \$21 million in 1990 was due to some

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extraordinary items recorded in the prior year, according to Michael J. King, president and chief executive of Software AG of North America.

Software AG continued to execute its 1987 plan to reorient itself from a supplier of mainframe-based software to a company providing enterprisewide client/server products based on industry standards.

In December, Software AG rolled out the first products in its Entire suite of client/server products. The Entire Open Function Server provides transparent communications between clients and servers, using some new and some existing Software AG products. In addition, Software AG introduced its first fully relational database management system, Entire SQL-DB Server. This product is based on the DDB/4 relational data base management system owned by Siemens Nixdorf Informationssysteme AG and licensed to Software AG.

In addition to the product and marketing changes, Software AG last year continued to transform the way it operated internally. Following the parent company's acquisition of the North American subsidiary in 1989, it took steps to operate as a worldwide corporation. Last year, it established two key policy boards, Market Strategy and Operations, to coordinate activities of the company. "Our challenge for 1991 was in getting all the communications working, getting all levels of management talking together," says King. "The challenge for 1992 is to move into new channels of distribution, UNIX and the whole right-sizing change IS is undergoing."

As Software AG addresses these challenges, it does so with a relatively new North American management team in place. One notable departure in 1991 was the founder and longtime chairman of the North American unit, John N. Maguire, who formally retired at the end of the year. His title was assumed by Peter Page, who continued as management board member of the Worldwide Group.

—David R. Brousell



Software vendor SAP AG couldn't have hired Hollywood to write a better script for 1991. Total corporate revenue hiked 38% to \$426.2 million (DM707.1 million) from \$308.8 million (DM499 million) in 1990, making 1991 the most lucrative year to date for the 20-year-old company. Net income skyrocketed 46.3% to a hefty \$74.3 million (DM123.3 million).

Why the big jump? Jeremy Coote, SAP's chief financial officer, says the company's worldwide market share grew substantially last year, as did its customer base. New customers added to SAP's fold last year included Switzerland-based Phillip Morris Europe, France Telecom and Texaco Corp. in Belgium.

The company credits its North American subsidiary, SAP America, for helping with the impressive bottom-line growth. The company reports an astounding 265% revenue growth over 1990, helped by new contracts with such heavyweights as Cincinnati Gas & Electric, Hitachi Data Systems Corp. and Mobil Oil Corp.

In October, SAP released version 5.0 of its R/2 System, a mainframe-based jack-of-all-trades package that includes a set of 10 application modules, including financial, human resources, materials management and other functions, tied to a central database.

This month, SAP will introduce its much-anticipated R/3 UNIX-based cooperative processing system in Germany. R/3 is the next-generation, UNIX-based version of R/2. The company says R/3 will offer

functions similar to those of R/2, but will run in a client/server mode on workstations and servers that use the UNIX operating system.

The R/3 system is based on Oracle Corp.'s relational database management system and will run on IBM's AIX, Hewlett-Packard Co.'s HP-UX, Siemens Nixdorf Informationssysteme AG's SINIX and other UNIX operating systems.

"The R/3 System started out as an application for the R/2 System," says SAP vice chairman Hasso Plattner. "Now, it is an equal system for distributed processing," he says.

The company will also continue to sell and support the R/2 System. R/2 users will be able to share data with R/3 systems, and all existing R/2 applications will run under R/3, according to Plattner.

Plattner says the company has its future strategy mapped out to keep the big revenue figures rolling in. He says SAP will continue to court large customers, but, with the addition of the R/3 System to its lineup, SAP will target smaller companies, hoping to add some 2,000 a year to its customer list.

"Our biggest threat to that is spoiling our chances by blowing up the new system, by not having the right quality," says Plattner.

—Mike Ricciuti



La Générale de Service Informatique continued to internationalize its business in 1991, a course it embarked upon only toward the end of 1990. "GSI was late getting into the internationalization process,"

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says Morgan David, manager of the European software and services program for International Data Corp. in Paris. "It was occupied with reducing its debt from the buy-out." The leveraged buy-out by GSI employees from Alcatel-Alsthom CGE was completed in November of 1990, leaving GSI with no debt, says Jean-Paul Brousse, GSI's vice president of marketing.

The United States and Germany were the targets last year. GSI purchased Warehouse Management Systems, a U.S. subsidiary of IMI Systems that had \$1.8 million in revenue in 1990. Warehouse Management's relatively small operation complements GSI Transcomm's strength in distribution and logistics, says Brousse. GSI also bought Lammert, a German vendor of payroll and human resources management software packages with \$17 million in revenue on 1990.

The Lammert acquisition follows up GSI's 1990 purchase of German firm Weber and Partner and Dutch concern Ucoms. All three companies provide good marketing bases for network integration services, which is one of GSI's core areas and a favored development direction, says David.

In further international moves in 1991, GSI opened up its first Asian subsidiary, in Singapore. GSI Information Systems Pte. Ltd. is charged with marketing, installing and supporting GSI's Tolas software in Singapore, Hong Kong and the rest of the Far East. Brousse states that "we don't have a great presence or lots of contracts yet in Asia, but we have lots of hope there."

In the meantime, GSI's total revenue for 1991 was up 12.6% over 1990 to \$422.8 million (Fr2.39 billion). Net income climbed 9.4% to \$18.6 million (Fr104.2 million). Operating income was up 24.3% to \$29.1 million (Fr164.1 million).

—Marsha W. Johnston



The impact of the rolling worldwide recession stunned Logica PLC last year. The systems integrator had its first after-tax loss: a minuscule £967 (\$1,705) on revenue of £197.8 million (\$348.9 million). It had recorded a net income of £5.3 million (\$9.4 million) a year earlier, but fiscal 1991 found Logica reeling from a decline in business, a downsizing and restructuring of U.S. operations, the cost of 400 layoffs and the burden of carrying surplus London office space.

Among the casualties was an R&D project to automate television studios. Logica withdrew from the ill-fated undertaking. "It became clear we didn't meet the expectations of our clients," says Logica marketing director Marion Lewis.

Such financial woes are new for Logica. Over two decades it carved a reputation for building and developing large systems, often for clients owning a potpourri of hardware and software systems. "If you want something developed from scratch, Logica has the name worldwide," notes London analyst Charles Burrows of James Capel & Co.

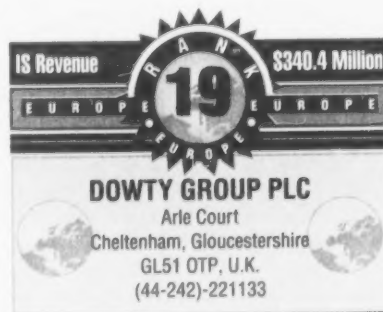
Some 75% of Logica's revenue comes from systems integration, and another 25% from consulting work. The company's bread and butter clients are U.S. and U.K. banking and insurance companies, U.K. water and electric utilities, and defense and government contracts. At the end of 1991, 52% of Logica's revenue was from the U.K., 26% from the rest of Europe, and just 9% from the U.S.

Marketing director Lewis says that this year, about one-third of its revenue will come from outsourcing as Logica moves away from fixed-

cost systems integration contracts. It wants to be "paid by the level of service we can offer, so that we're being compensated for value delivered," Lewis says. Logica is uncertain if it will transfer clients' assets and employees to Logica as part of its outsourcing strategy.

U.S. operations squeezed a profit of £400,000 (\$705,000) in the last half of 1991 after two years of losses. Logica slashed its costs by 30% in 1991 by centralizing sales and marketing. It also hired a new president and a vice president of sales and marketing. Managing director David Mann is "delighted that under new management the U.S. operation is now trading profitably, but the next stage is to look at growing the business," a process that is sure to be slow at first, says Mann.

—Barbara Benson



Aerospace and defense conglomerate Dowty Group PLC, which as recently as 1990 had been snapping up data communications businesses around the globe, last year considered divesting itself of those new businesses, which are consolidated under the Dowty Communications label. Struggling to fight off a hostile takeover, the Group felt pressure from financial analysts to let go of Dowty Communications, which analysts had believed to be a drain on the Group's core businesses.

But the Group successfully fought off the takeover, and officials now say it will hold on to Dowty Communications, which has turned



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out to be healthier than expected.

At first glance, it would appear that analysts had reason to be skeptical about the division's continuing ability to contribute to the Group's bottom line. Dowty Communications's revenue dropped 2.2% to \$340.4 million (£193 million) in 1991. Consequently, its contribution to group revenue, which grew 5.2% to \$1.36 billion (£769 million), slipped to 25% of total corporate revenue from 1990's 27% share. The Group does not disclose profits of individual divisions.

But Dowty Communications's revenue decline is rather misleading, coming a year after bolstering its bottom line through a major acquisition. In 1990, extraordinary 49% revenue growth came in large part from its purchase of Danish data communications manufacturer Dataco A/S. In 1991, solid demand for both systems integration services and network products allowed the division to keep its staffing level roughly the same, in contrast to its announcement the prior year that it would have to cut staff by 17%.

This healthy turn of events has allowed it to aggressively acquire complementary products and services and to invest heavily in research and development.

Among the results of these activities is a new frame relay WAN system, multiprotocol bridge/routers (brouters), intelligent hubs and narrow-band Integrated Services Digital Network (ISDN) interfaces. In development are high-speed LANs based on the 100-megabit-per-second Fiber Distributed Data Interface (FDDI) specification; cell relay systems based on the emerging asynchronous transfer mode (ATM) standard; and broadband ISDN products.

In addition, the company is continuing to develop its modem line, whose products range from low-cost personal computer add-in cards to enterprisewide fax/modem servers.

Its diverse product line also includes Cognito, a mobile data trans-

mission system launched last year. Unfortunately for Dowty, Cognito sales have not matched the high hopes with which it was launched.

—Jon Kaye



Among France's large software and services companies, CGI Informatique has the distinction of being the most profitable, with the highest ratio of net earnings to revenue. CGI upheld that distinction for its last fiscal year, which ended August 31, 1991, when that ratio totaled 9.4%. DATAMATION estimates that CGI recorded a rise in consolidated revenue of 9.2% to \$315.6 million (Fr1.78 billion) for 1991, with net income of \$29.7 million (Fr167.6 million), a 12.5% increase from the previous year.

Certain small French software and services companies have higher margins, says Morgan David, manager of the European software and services program for the Paris office of market research firm International Data Corp. However, CGI has typically bested competitors in its weight class. Why? "Margins are high on CASE [computer-aided software engineering] products, and CGI manages to add a range of services to those products," says David. "CGI has also always remained on the crest of the wave of investing and exploiting new technologies," which attract a higher price premium than old technologies.

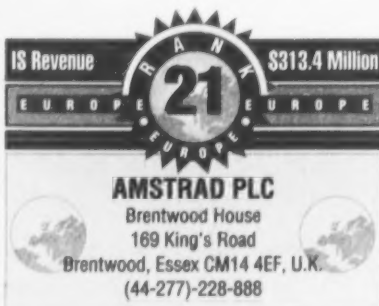
In PACBASE, for example, CGI has one of the largest installed bases of CASE tools in the world, according to David. This provides CGI with the distinction of being one of an elite

group of European software companies that are successful with packaged software in the U.S. market. In fact, between 28 and 29% of the 1992 revenue is expected to come from the United States, says Jean-Louis Bernaudin, CGI director of marketing; 21% is expected to come from Germany.

CGI's total revenue for 1992 should reach Fr2.1 billion (\$372 million), predicts chairman Robert A. Mallet. This would be about a 20% increase from 1991. However, Bernaudin says, external growth will be lower in 1992 because CGI isn't likely to have as many acquisitions as it had in 1991.

Last year, CGI bought three companies. In April, it purchased London Software Systems Specialists Ltd., which specializes in systems for industrial distribution. This was followed by the purchase of Interprogram GmbH, with 1991 revenue of more than DM36 million (\$6.4 million). Interprogram distributes U.K.-based Synon's AS/400 CASE tool. With the arrival of CGI's PACBASE, CGI Interprogram will no longer distribute Synon's product, but will continue its support services, says Bernaudin. In October, CGI bought Decision International SA, a small French company with 1990 revenue of Fr120 million (\$21.3 million) that specializes in UNIX-based industrial systems for small businesses.

—Marsha W. Johnston



The glory days are becoming an ever more distant memory for Amstrad PLC's once high-flying and high-pro-

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file personal computers business. For the second year in a row, total corporate revenue declined—down 25% in 1991 to \$701.6 million (£398 million)—while net earnings melted into a \$35.1 million loss (£19.9 million). With intensive price competition from Asian PC makers proving too tough to tackle, Amstrad chairman Alan Sugar is putting more muscle into the company's core business, inexpensive audio and video equipment such as VCRs and satellite dishes. Amstrad's IS revenues were down almost 40% to \$313.4 million (£177.7 million) in 1991.

Amstrad's PC business has lost a significant share of the market over the past three years, dropping from second to fifth place in the United Kingdom, according to Dataquest Inc. of San Jose. Direct marketers like Dell Computer Corp. and Gateway 2000 Inc. are scoring points against Amstrad throughout the market, as are a flying wedge of Asian clone makers and a squad of locals operating out of garages. In response, Amstrad launched three Intel i486-based machines aimed at the business market—the 6486sx, the ES8486 series and the LP8486—at the Hannover, Germany, CeBit fair in March. The high-end machines may not be enough to prevent further erosion of its business, though.

Further clouding Amstrad's prospects is a feud with its largest distributor, P&P of Redditch, England. Last year Amstrad claimed that P&P failed to properly promote the equipment, while the distributor insisted that the vendor wasn't offering competitive products. Shipments were halted, though an Amstrad spokesperson says discussions continue.

Sugar insists that the PC market is bouncing back after three years in the doldrums, but Amstrad's recent performance does not suggest it is going to return to its winning ways anytime soon.—Jon Kaye



April 29, 1992 was a red letter day at Reuters Holdings PLC. The on-line information services and securities-trading systems company finally launched its long-delayed foreign exchange brokerage system. Dealing 2000-2, which runs on IBM-compatible PCs sourced from Intel Corp., is expected eventually to revolutionize trading in the \$700-billion-per-day worldwide currency markets by automatically matching buy-and-sell orders of hundreds of banks and investment banks. The system will supplement and eventually replace many of Reuters's 116,000 foreign exchange terminals, currently a mix of dumb terminals and PCs connected to Reuters via telephone lines. Customer reaction to Dealing 2000-2 has been good, which is a relief to company officials. Software development hitches and legal hassles held up introductions of Dealing 2000-2 and the similar futures market system, Globex, which will be launched this summer. These delays have cast a shadow over the company's prospects for more than three years.

Nonetheless, last year wasn't all bad. Net earnings rose 10% in 1991 to \$404.6 million (£229.6 million), while total corporate revenue was up 7.1%. DATAMATION estimates Reuters's IS revenue increased 7.5% to \$284.5 million (£161.3 million), derived from a percentage of selling access to the company's real-time information and price services, from historical databases, and from sales of transaction software and trading room systems, which are sourced from Digital Equipment Corp., Hewlett-Packard Co., IBM and Sun Microsystems Inc. Up until about two years ago, Reuters manufactured

its own terminals, but the company now resells Intel PCs or installs its software on compatibles supplied by customers. Reuters still makes its own data communications switches and keyboards. The company's original business of supplying information to newspapers and magazines has shrunk to about 6% of its revenue.

Reuters also introduced several other new products in 1991, mainly software enhancements to its existing offerings. The firm needs the new products in its stable because its present system for currency and securities traders has essentially saturated the market, according to analysts.

The new chief executive officer, Peter Job, faces other significant challenges. First among them is filling the gap left by the retirement last year of Glen Renfrew, Reuters's former chief executive officer and the key figure in the company's dramatic growth over the past 10 years. Furthermore, a reorganization of the company into five geographical regions late in the year has yet to bear fruit. And on the horizon are even bigger challenges. Ironically, the banks that are Reuters's biggest customers have developed two foreign exchange trading systems, called Electronic Broking Service and Minex, that they plan to launch next year. Those two systems will be in direct competition with Reuters's offerings.

—Janet Lewis



Thanks to BSO/Origin Technology in Business's unconventional "cell structure" organization, the

Netherlands's largest systems integrator and technical consultancy has launched a new and successful wave of Dutch colonization. Known outside the country as Origin Technology in Business, 15-year-old BSO has planted its decentralized operating cells or "settlements" in 14 countries throughout Europe, Asia and the Americas. Their growth fueled a 31.7% increase in revenue last year, up to \$283.4 million (\$530 million).

Each BSO settlement is an independent profit center with a staff of about 50 consultants. As soon as the employee count exceeds this figure, explains marketing and sales vice president Johannes Vunderink, a portion of the staff is "hived off," and a new colony, with its own geographic territory or market niche, is formed. "Our strategy goes back to human nature," says Vunderink. "We believe an ideal human tribe would consist of 50 to 70 people. In this size group, everyone knows each other, and natural leaders emerge."

It may sound to outsiders like a high-tech hodgepodge of the movies "Quest for Fire" and "Invasion of the Body Snatchers," but Vunderink claims BSO's organizational philosophy is designed expressly to manage accelerated international growth. And that's exactly what the company has been experimenting with for the past two years. In 1989, BSO had offices in only three countries: Germany, the Netherlands and Switzerland. Today its far-flung empire extends beyond Europe to Brazil, India, Singapore and the United States.

While BSO's revenue has grown, earnings lag behind. The company's employee-intensive business requires recruiting more worker bees to populate the new hives as new contracts come pouring in. Consequently, in 1991, the company found itself swarming with 850 new members for a total population of 3,700—a 34% increase over 1990 levels and a 200% gain over 1989. All that international recruiting consumed expensive—and unbillable—man-hours. Although productivity

ratios for consultancies and integrators are often anemic, BSO's paltry revenue per employee of \$85,000 dips dangerously low.

Poor productivity was not BSO's only problem last year. International expansion also has cut deeply into profits. Despite its overall revenue growth, BSO's net earnings declined 60.9% to a feeble \$4.5 million (\$8.4 million) in 1991. Start-up costs for large international contracts, such as a long-term technical support pact with AS/400 application provider Software 2000 Inc. and a recent \$60 million facilities management agreement that the firm's Brazilian operation recently signed with Shell Corp., promise to hold down earnings for at least another year.—Don Marks



IS Revenue **24** \$282.0 Million

EUROPE

NORSK DATA AS
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Norsk Data AS's financial tailspin accelerated last year. Once a highly successful maker and marketer of minicomputers throughout Europe, Norsk Data's fortunes have been declining for years. Despite a strong position in Scandinavia when the company was at its peak, it was much too small to fight larger competition and the trend among customers away from proprietary to open systems. As a result, revenue plummeted 26%, to \$282 million (Nkr1.813 billion) and losses increased, to \$126 million (Nkr810 million). Since 1988, Norsk has lost Nkr2.3 billion.

The group's largest operating losses were produced by ND Comtec, which sells a proprietary system for newspaper publishing, and by Norsk Data's German subsidiary.

Collectively, they lost Nkr340 million (\$53 million). Norsk is folding Comtec after failing to find a buyer—a deal to sell it to Britain's QED Technology Ltd., part of the Maxwell group, was halted after the death of Robert Maxwell. Meanwhile, the Germany subsidiary was drastically downsized.

Most of Norsk Data's loss was due to the cost of a major reorganization last autumn. The estimated Nkr665 million (\$103 million) reorganization converted the company from a computer manufacturer to a distributor and services group, comprising three independent subsidiaries. Managing director Erik Engebretsen's strategy appears to be to raise capital by selling shares in the spun-off units and by bringing in strong partners that can strengthen and expand the business.

A first step in the strategy was to sell 80% of the shares in ND Partner Systemleverandør AS, which develops and sells IT solutions to private business and the public sector, to the Norwegian subsidiary of Siemens Nixdorf Informationssysteme AG. The other spun-off subsidiaries are ND DataShop AS, a distributor of standard computer products and Formula OpenSoft, which sells its own administrative software for finance, inventory and orders. Reportedly, the three subsidiaries showed a profit after the first three months as independent companies.

Another step in the reorganization strategy was massive layoffs—800 positions were eliminated in 1991, and another 500 positions will be eliminated this year. Total employment this year is expected to be around 1,300, or less than half of the staff level of early 1990.

This year is decisive for Norsk Data. The company cannot afford any additional setbacks and must strengthen its balance sheet, say analysts, who concur that the drastic reorganization was the only way the company could survive. Although Engebretsen succeeded in reducing



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debt and selling assets to trim the balance sheet by NKr1 billion (\$156 million) to NKr1.7 billion (almost \$266 million), there is hardly enough equity left after the restructuring charges to support the debt.

—Weje Sandén

IS Revenue

25

EUROPE

TULIP COMPUTERS INTERNATIONAL B.V.

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5231 DC 's-Hertogenbosch
The Netherlands
(31-73)-405222

Considered by some observers to be the Compaq Computer Corp. of the Netherlands, Dutch PC maker Tulip Computers International BV has pursued an upscale strategy that so far has failed to blossom outside of Holland. Founded in 1979, this R&D-minded, 670-employee company manufactures and sells its own line of Intel-based, IBM-compatible PCs—including notebooks, laptops, 286 and 386 desktops and tower-style 486 servers—at prices slightly below IBM's.

The trouble is: despite Tulip's continued investment in new technologies, and its steady development of a pan-European service and support network, big corporate buyers aren't taking notice.

Tulip's 1991 revenues were essentially flat at \$215.5 million (G403 million). Net earnings waned, down 13.9% to a painfully low \$8.7 million (G16.3 million). Jonathan Sheldrake, senior research analyst with International Data Corp. in London, attributes this dismal financial performance to the price-competitive European PC market, for which, he estimates, overall revenue declined by nearly 15% in 1991. And, he adds, Tulip incurred high expenses in an aggressive effort to expand distribution channels throughout Europe.

According to Sheldrake, Tulip shipped 116,618 units last year for a 1.3% share of the European PC market, but the lion's share of those shipments were sold inside the Netherlands, where Tulip's market share is second only to IBM's. Elsewhere, the company has struggled just to make its presence known.

Part of the problem rests with Tulip's upscale strategy. As European PC buyers gradually

succumb to low-cost clones, Tulip has been forced to peddle its high-caliber wares to discriminating buyers. Escalating labor costs in the Netherlands prohibit the company from indulging in cutthroat price competition. Yet corporate customers willing to pay a price for quality usually expect the bedrock stability of a world-class vendor in return.

The threat of a takeover looms large in Tulip's future. In early 1992 the company sold Compudata BV, its successful Benelux distribution and marketing arm, to Japanese printer and peripherals company Star Micronics. John Scholes, president of Regent Associates International, a London financial analysis firm, believes that Tulip's brand recognition and Dutch distribution channels could prove palatable to any of several Taiwanese concerns seeking entry to the European market.

But avenues for continued survival do remain. Tulip could, for example, push its vigorous research and development unit further into the design of high-margin niche technologies, such as the secure desktop system with data-encrypting disk drives that it introduced in early 1992. —Donald R. Marks

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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William H. Gates,
chairman and CEO,
Microsoft Corp.,
embraces Windows
Open Services
Architecture (WOSA)

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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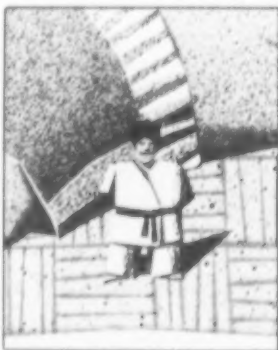
Could Apple have finally gotten serious about IS needs? Stranger things have happened.



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What CIOs Need To Do Now

Heavier investments in IS strategies and tools will position CIOs to take advantage of better economic times.

During the past two years, many chief information officers opted for short-term solutions in response to the weak economy. Postponing or underinvesting in new technologies, giving inadequate attention to new application opportunities, delaying projects, reducing head counts and employing fewer contract programmers may have provided an immediate budget benefit, but in many cases these responses do little to ensure long-term success. These moves may even work against future success if they conflict with strategic goals or undermine an information systems department's ability to contribute to the company's recovery as the economy picks up.

Many organizations are not investing heavily in IS strategies that will position them to take advantage of better economic times, according to Deloitte & Touche's fourth annual survey of CIOs, "Leading Trends In Information Services." A combination of factors, including the recession and pressure from upper management, led many CIOs to pay particularly close attention to achieving the "lowest possible cost" part of their goal by sacrificing long-term opportunities to improve service and perhaps reduce overall IS costs.

Not all CIOs are failing to properly position their IS departments for the long term. CIOs who actively participate in their organizations' strategic plans are better positioned to take ad-

BY KATHRYN HAYLEY, JENNIFER FORDONSKI AND BOB PUCKETT

vantage of the economic recovery. They are viewed as key contributors to the organizations' financial performance and, as a result, receive larger budget increases, according to the 430 CIOs of large companies (with average revenue of \$2 billion) who responded to the survey last year.

However, almost 40% of the CIOs responding to the survey don't partici-

involved CIOs had to suffer with miserly 1% budget increases.

A successful strategy for a CIO, in addition to full participation in the company's strategic-planning process, should include the adoption of new application development techniques, client/server architecture and open systems, and the revamping of business functions. Outsourcing is rightfully viewed with alarm by many CIOs as a threat to their jobs and their departments, but it can also be hazardous to the company's

financial health over the long term if it renders the company incapable of quickly responding to competitive pressures.

Of the application development techniques currently being used, the most successful appears to be adherence to application development methodologies. Approximately 87% of the respondents said they used an application development methodology. On a scale of proven effectiveness from 1 to 10, CIOs rated application development methodologies at 6.1. In fact, such methodologies were rated as far more effective than a dozen other techniques or products (see

table, "A Methodology Is More Effective Than A Product").

Advanced applications development tools such as computer-aided software engineering are viewed as high-value items by CIOs, but CIOs are missing an opportunity by failing to implement them broadly. One of the primary reasons cited for the lack of widespread

A Methodology Is More Effective Than A Product

Computer-aided software engineering (CASE) tools, PCs and other products are not as effective in improving the applications development process as an applications development methodology. Effectiveness of approaches was ranked on a descending scale from 10 to 1.

Technique	Effectiveness Ranking
Applications development methodology	6.1
Fourth-generation languages	5.9
Prototyping	5.8
Joint-application development sessions	5.7
PC-based development	4.6
CASE	2.8
Application generators	2.7
Accelerated development cycle	2.6
Object-oriented techniques	1.4

Source: Deloitte & Touche

participate in their corporations' strategic planning. These CIOs face double jeopardy: in the short term their departments' budgets will suffer and in the longer term they are more likely to lose their jobs. CIOs who actively participated in corporate strategic planning received 3.5% budget increases on average last year, whereas the less-

adoption of CASE tools is cost, including the expenditure for new implementation standards and training. Only about half of the IS departments currently have at least one CASE tool, and only about one-third of the development staffs are using them. CIOs are satisfied with the capabilities of CASE tools, although they realize that their expectations had been too high.

CIOs now view CASE tools as being among several techniques that should be employed when money becomes available to invest in the software, personnel, training and additional CPU cycles necessary to use the tools effectively. About 60% of the development staffs will be using CASE tools within two years, according to the CIOs, as the economy and the companies' financial positions improve.

Many leading CIOs appear to be especially interested in future use of lower CASE tools, which aid in code generation and testing; the CIOs indicate that usage will more than double. The reason for the shift may be that cost savings are expected from applying lower CASE tools to traditionally expensive application development projects.

The client/server architecture should play an important role for CIOs trying to reduce cost and improve service. At present, however, few CIOs appear to be implementing the client/server and open systems approaches on a widespread basis. Only 8% of the respondents claimed to be currently using the distributed architecture, and only 4% were using an open-systems approach.

There's strong interest in the architecture, but CIOs say they lack the resources to implement it. Considering the cost savings expected from the client/server and open architecture approaches, any delay in implementation denies the IS department the opportunity to improve service and response times in the short term and save money in the long term. Since a system's cost per million instructions per second (MIPS) is substantially lower in a client/

Outsourcing Lessons Learned

CIOs found that the actual financial benefits of outsourcing were less than they had anticipated. Benefits were ranked on a descending scale from 10 to 1.

Benefit	Anticipated Ranking	Actual Ranking
Head count reduction	6.0	5.2
Refocusing of IS resources on strategic systems	4.9	4.4
IS cost reductions	5.3	4.2
Improved control of IS spending	4.4	3.6
Avoidance of major IS expenditures	4.6	4.0
Improved quality/delivery of IS services	5.5	4.7
IS risk reduction	4.1	3.8
Strategic advantage over competition	2.5	1.9
Vendor sophistication and expertise	5.6	4.9

Source: Deloitte & Touche

server environment, and the development tools are comparable with or superior to those used in a mainframe environment, CIOs adopting the client/server approach in some cases will find significant financial benefit.

The fact that only 26% of the respondents predict use of client/server architecture within two years indicates that many CIOs are taking a conservative stance. They may be suffering from the initial sticker shock of moving from a mainframe to a client/server environment. Or they may be waiting until the technologies become proven and there

high cost of converting mainframe applications to the new architectures precludes wholesale adoption.

Instead, the IS shops in these companies are evaluating the various alternatives and closely scrutinizing the appropriate application of these new technologies. Other reasons for caution include concern over data integrity, system availability and potential volume limitations. As a hedge for IS departments that aren't ready to plunge into the new architectures, one option that should be considered is developing new applications using CASE tools, so that IS can take advantage of client/server technology once it

becomes more established without having to redevelop an application.

The lack of broad adoption of an open-systems approach is another indicator of CIO caution. Long-term contracts with vendors of proprietary hardware, corporate inertia, a shortage of proven technologies and a respect for the complexity of the transition period are all understandable concerns.

Although there's been a marked rise in interest in the past few years, only 17% of respondents say they expect to be in an open-systems environment within two years. Still, a majority of firms responding to the survey are moving toward an open-systems architecture. And a majority of that group, 57%, has established companywide standards, and 43% say the architecture is a divisional or departmental standard. Some 29% are implementing open systems standards for new applications development. Many CIOs are waiting until the effectiveness of open systems is better proved before completely committing themselves to adopting them.

Approximately 20% of the CIOs are outsourcing strategic functions such as applications development; almost 43% have contracted with third parties for disaster recovery. Selling a data center or transferring applications development and maintenance in a wholesale fashion to a third party without hands-on participation of internal technical

Outsourcing is rightfully viewed with alarm by many CIOs as a threat to their jobs.

is a track record for determining which types of systems can and should be successfully implemented in this environment.

In part, the low percentages of current or near-term adoption of the architecture are due to the large size of the respondents' organizations—the average IS budget for the respondents was \$42 million. In these large shops, the

staff may provide a short-term economic benefit, but experienced CIOs say there's a price to be paid.

Although outsourcing has been widely proclaimed to be a promising solution to the problem of uncontrolled costs, companies that have tried outsourcing typically have been disappointed with the results. The gap between anticipated and actual benefit is large. CIOs ranked the anticipated cost-reduction benefit for IS departments at 5.3, but ranked the actual benefit at 4.2.

In other words, the actual benefit of outsourcing was 19% less than the expectation (see table, "Outsourcing Lessons Learned"). The key to a successful outsourcing arrangement is outsourcing project-related work while maintaining direction and control internally or outsourcing in a wholesale fashion only those services that don't have strategic implications.

Even their approach to outsourcing reflects a financial focus that may not serve CIOs well in the long term. A lack of cost justification was the highest-

ranking factor in CIOs' rejection of outsourcing, followed by control over quality of service or product. Control over corporate IS strategy was considered less significant than costs or quality.

While some CIOs are taking a go-slow approach to CASE tools, client/server architecture and open systems, they

CIOs express high confidence in business reengineering.

are wholeheartedly embracing business reengineering. A top-to-bottom review and revamping of a customer service program or distribution system, with IS taking part, is commonplace these days: CIOs reported that their departments were involved in an average of 1.6 reengineering projects. CIOs say they are comparatively well-satis-

fied with their reengineering programs, although results are below expectations. There's a 33% gap between the projects' expected and actual contributions to profit.

Nevertheless, CIOs express high confidence in business reengineering and expect their programs to exceed expectations soon. Although the profit contributions to date may not match CIOs' plans, business-reengineering programs help CIOs contribute in concrete ways to the success of other departments within their firms. By helping other departments adopt technology to streamline operations, reduce staff and improve services, a CIO adds value to the company, making it "leaner and meaner," and enhances the image and value of the IS department.

Kathryn Hayley is a partner in the information technology practice of Deloitte & Touche in Chicago.

Jennifer Fordonski and Bob Puckett are senior consultants in the information technology practice.

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MANAGEMENT

TECHNOLOGY TRENDS

Integrators Ride The Client/Server Wave

Most MIS managers have no problem recognizing the benefits of implementing client/server computing applications; but most also lack the time and in-house expertise to get client/server systems off the drawing board. That's creating a hot new growth market for third-party suppliers to provide client/server implementation services.

According to a recent study by the Business Research Group, two-thirds of companies implementing client/server systems will look for outside help to design and implement their systems. And when asked who will play the most important role in the development of such systems, respondents named systems integrators most often.

Systems integrators are pushing into the market for client/server implementation services at full throttle. Another recent poll by Business Research Group of 100 leading systems integrators shows that, on average, systems integrators expect their share of business activity related to client/

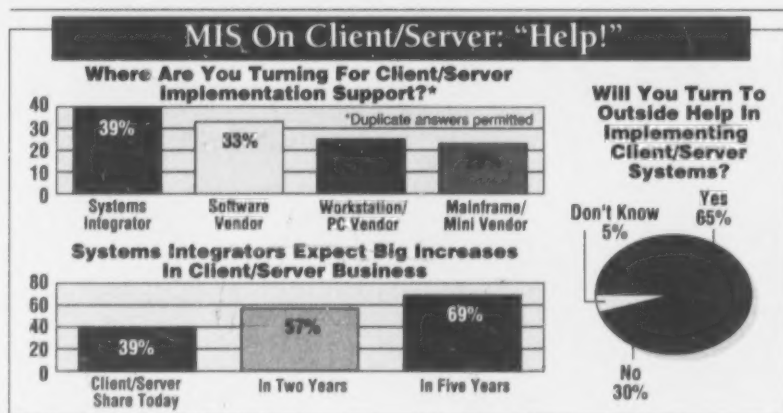
server systems to grow from 39% to 69% over the next five years.

The development of client/server computing will continue to see tremendous growth in most markets throughout the 1990s and beyond. BRG sees the market for just the hardware associated with client/server implementations growing from \$23 billion in 1991 to \$38 billion in 1995.

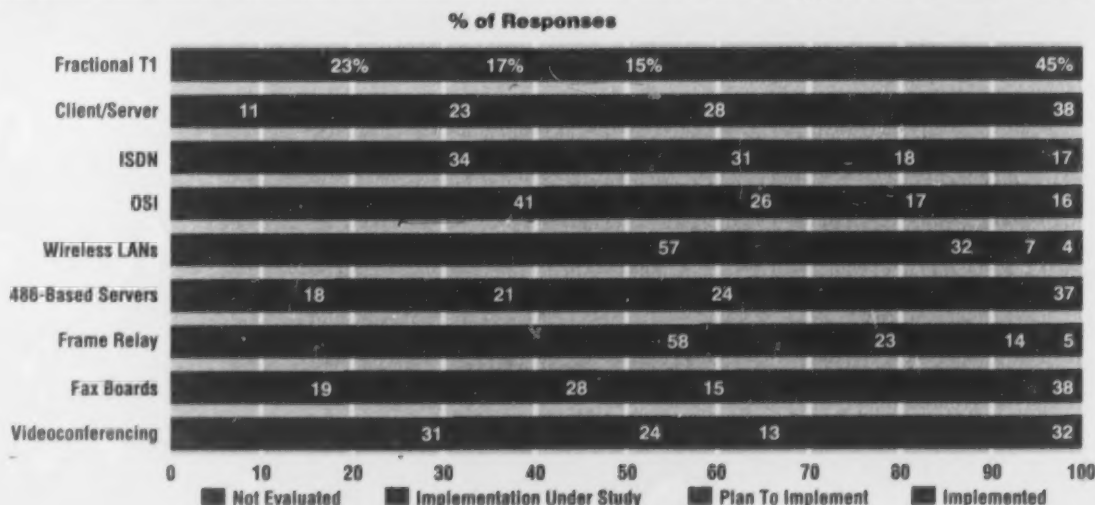
An exact definition of what constitutes client/server computing still eludes both the vendor and user communities, though most definitions include shared processing between a host

server and a client workstation. But it's generally agreed that a goal for client/server computing is more effective integration of information resources over the enterprise network to improve the productivity business. ■

Warren Childs and Kathryn A. Tito, Business Research Group. For more information, call Maral Mahdasian at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.



DATAMATION's Technology Implementation Index: Networks/Communications



■ DATAMATION each month surveys a select group of its readers—the DATAMATION Technology Panel—to investigate the implementation of new technologies by key user organizations.

MANAGEMENT

ECONOMIC TRENDS

Software Skipped Recession Again

When it comes to economic downturns, rule No. 1 is: "Everybody always gets hit." Maybe not all at the same time but, generally speaking, every sector of the economy really does come under pressure at one phase or another of the business cycle's dip.

Not so for the U.S. software industry, which rode high and dry during the last two years. Truth is, software remains one of the economy's fastest growing sectors.

Just listen to this. Data from the U.S. Commerce Department and from the Framingham, Mass.-based market research house International Data Corp. show that packaged software sales grew at nearly four times the rate of the Gross National Product last year—up 13.4% to \$20.3 billion.

IDC forecasts that software sales will rise by another 14.3% in 1992 and will average 13.9% annual growth between 1991 and 1995, bringing the total sales to \$34.2 billion.

Recent estimates of software sales by the Software Publishers Association show that North American microcomputer software sales nearly tripled between 1987 and 1991, surging from \$1.97 billion in 1987 to \$5.71 billion in 1991. Sales climbed 26.2% in 1990 and 24.6% in 1991.

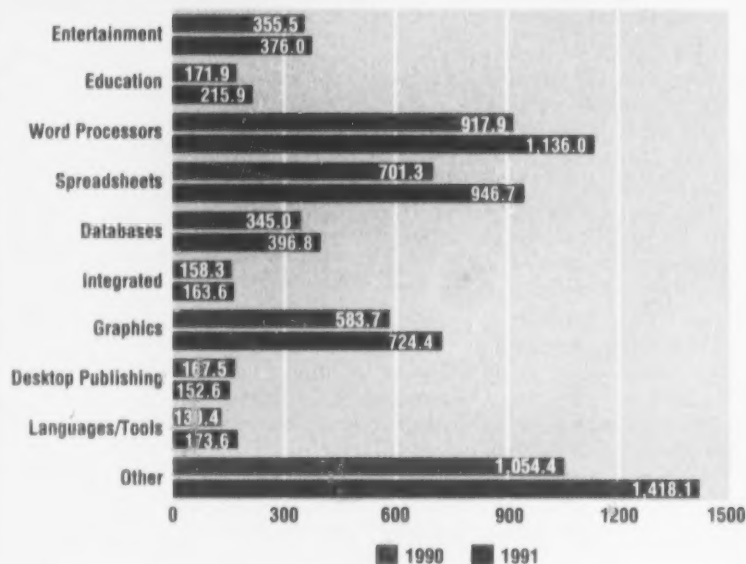
The biggest winners included spreadsheet software (up by 35%) and languages/application development tools (33.1%). Sales of software for the Apple Mac jumped by 37%; software sales for MS-DOS-based PCs jumped 25.7%.

Sales of Windows applications skyrocketed by an astounding 228% during a single 12-month period between the fourth quarter of 1990 and the fourth quarter of 1991. Sales of Windows applications accounted for two-thirds of the total growth in microcomputer software sales in 1991.

By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services contact Dan Buchan at (617)-630-2105.

Software: Looooking Gooooood!!!

North American microcomputer software sales (\$ millions)



Data: Software Publishers Association

The Economy At A Glance

U.S. Economy: Macroeconomic And Industrial Indicators

	Q4/91	Actual Q1/92	1991	Forecast 1992	1993
Gross National Product	0.4	2.0	-0.7	2.0	2.7
Business Investment In Equipment	-1.6	1.6	-3.4	1.9	4.7
Government Spending	-5.4	2.8	0.9	-2.3	-3.7
Consumer Spending	0.0	5.3	-0.1	2.6	2.8
Exports	9.7	1.0	6.4	5.8	7.6
Imports	2.1	-1.5	0.3	4.6	3.7

All calculations are % change in 1987 dollars; quarterly figures are seasonally adjusted annual rates.

	March 1992	Feb. 1992	% Change 3/92-2/92	March 1991	% Change 1991-1992
Manufacturing Production (1)					
Process Industries Total	108.6	107.9	0.6	103.1	5.3
Chemicals	114.3	113.3	0.9	108.2	5.6
Petroleum	107.3	106.9	0.4	108.5	-1.1
OEM Total	109.1	108.9	0.2	107.6	1.4
Computers & Peripherals	163.9	162.4	0.9	155.1	5.7
Communication Equipment	110.6	110.4	0.2	109.9	0.6
Transportation Equipment	97.1	96.9	0.2	95.0	2.2
Services Employment (2)					
Finance, Insurance, Real Estate	6.662	6.645	0.3	6.685	-0.3
Health Care	8.486	8.457	0.3	8.105	4.7
Computer & Data Processing	.864	.863	0.2	.817	5.7
Transportation/Utilities	5.729	5.727	0.0	5.764	-0.6
Retail Trade	18.836	18.794	0.2	18.990	-0.8
Wholesale Trade	5.947	5.940	0.1	6.063	-1.9
Government	18.939	18.815	0.7	18.774	0.9

(1) Index 1987 = 100, seasonally adjusted

(2) Millions of persons, not seasonally adjusted.

Source: Commerce Dept. and Cahners Economics

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

AUGUST 15, 1992



Robert E. Cook,
chairman and CIO,
Systems Center Inc.,
with Solve:Connect For EMA

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SPECIAL REPORT

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1989

5.6%

Salaries Scale Up 5.5% In 1992

IS paychecks this year will leap more than they did last year, but health care benefits are taking a beating.

The economy may be slowly climbing out of the abyss, but your paycheck probably won't grow as much as you wish it would this year. Respondents to DATAMATION's annual salary survey say their companies plan merit increases in 1992 that average just over 5.5%. That's better than last year's predicted 4.7% raise, but not up to the 6% + increases of the good old 1980s. With inflation this year running at 4.2%, according to DATAMATION sister organization Cahners Economics, IS professionals—like the rest of the work force—will stay a little ahead of the game, but not by as large a margin as was common in the last decade.

The moderate salary increases reflect a relatively cool hiring scene. Most survey respondents expect their IS staffing levels to be stable this year. More than 74% of shops will maintain current staffing levels or will add personnel, according to the 1,750 respondents to the 1992 DATAMATION budget survey conducted earlier this year (See "The Hot Applications of 1992," May 1, 1992, p. 34). There may even be cause for optimism in certain industrial sectors, as the economy begins to rebound. Securities firms like Charles Schwab & Co. Inc. of San Francisco; robust banks like Banc One Corp. of Columbus, Ohio; and healthy biomedical companies like Ciba Corning Diagnostics of Medfield, Mass., report steady growth of their IS staffs. "Our IS group has been growing along with the company," says Cliff Hubbard, Ciba Corning director of information services. Hubbard's 85-person domestic IS organization will grow to 100 or more this year, he adds.

The largest salary increases will be received by IS staffers in the Dallas/Ft. Worth and Houston areas.

They're expected to bring home a 6% raise this year, as former Rust Belt industries continue to migrate to the Sun Belt. For example, Exxon Corp. earlier this year consolidated its U.S. data centers into a megacenter in Dallas. At the other extreme, ISers in the Los Angeles area, subjected to the tribulations of the post cold war aerospace industry, will see, on average, no more than 4.7% increases. The aerospace industry there has lost more than 20% of its jobs since 1989, and almost half of the loss occurred last year, according to the California Employment Development Department in Sacramento. An increased labor pool means that companies need not offer top dollar to keep people. Pacific Bell Co. in San Francisco offered an average raise of 4% in each of the last two years, says Jack Hancock, executive vice president of technology and product support.

Weak minicomputer companies in the Boston area have also been downsizing, and their former employees offer local IS managers a smorgasbord of choices when they have positions to fill. "There are good people on the street locally," observes Hubbard of Ciba Corning. "A lot of companies cut their C team people years ago, and now they're cutting the B team members." Ciba's raise pool this year is less than 5.5%, he says; the overall average for the Boston area is 5.1%.

The woes of the defense/aerospace industry—and tough times at U.S. automobile makers—are also reflected in the modest raises expected in those industries. Companies in the transportation business expect to give among the smallest raises of any industry sector, 4.6%, in 1992. In contrast, Data Processing services companies—including many consulting firms—top the average salary rise by

BY KATE COLBORN

Raises Bounce Back

The average 5.5% hike in salaries for 1992 will beat the inflation rate this year, but lags behind the increases of the mid-1980s.



more than a percentage point, predicting raises of 6.7%.

Despite the layoffs, there are still IS workers in short supply. Still attracting salary premiums, signing bonuses and other lucre are OS/2 developers, LAN managers and code writers knowledgeable in object-oriented programming. Buffalo-based systems integrator Computer Task Group Inc. has more openings for consultants with OS/2 PC operating system skills than for those with experience on the AS/400 midrange platform, according to Nina Rasmussen, Western regional staffing manager.

The move to a distributed architecture can produce jarring changes for users and IS departments alike. In situations where IS must help users adjust to radically different systems, companies are paying above average salaries for the combination of client/server and interpersonal skills. Banc One Services Corp., the Columbus-based data processor and systems developer for the nationwide bank-holding company, is actively recruiting professionals with the interpersonal skills to handle the transition to a new, distributed architecture at 1,300 branch offices. "They will need to be competent in the technologies we're using in our new systems and also very sensitive to relationships," says Bob Barrett, BOSC president and chief executive officer.

Systems analysts comfortable with business issues have been at a premium for years, and the recent layoffs and downsizing of corporate staffs have not yielded quite enough people to fill the vacuum. Ciba's Hubbard says that although the 11 application developers the company recently hired were attracted to the company at the sala-

Source: DATAMATION 1992 Salary Survey

ries he predicted, newly hired individuals coming in at higher levels, such as forecasters and planners, who have business as well as systems experience, commanded salaries 15 to 20% higher than he anticipated.

Programmers experienced with computer-aided software-engineering tools and knowledgeable about distributed processing can also demand premium salaries this year. "We are competing creatively in the market for these people," says an official of a major midwestern financial institution. Signing bonuses and generous relocation packages are among the benefits available for IS professionals with the right stuff, she adds.

SPECIAL REPORT

SALARY SURVEY

The MIS manager for a midwestern health care company complains that he can't persuade management that LAN managers deserve a salary premium over end-user support personnel. "Our existing salary structure can't attract the people we need," he laments. "LANs are new to the company and new to management, and I haven't been able to prove to them that they have a value." But corporate recruiter Scott Curd, of Houston-based construction and engineering firm Brown & Root Inc. reports that the company pays networking people 15 to 20% more than programmers with equivalent years of experience.

Better financial opportunities appear more likely at smaller companies. Firms with sales under \$5 million expect a bigger than average jump in salaries this year than those with sales over \$1 billion—a category that consists mostly of public companies under pressure from investors to control costs. Small company raises will average 7% this year; organizations with more than \$6 billion in revenue will offer only 5.5%.

While, overall, salaries are headed upward, benefits are another story. The nation's medical bills have been increasing at an annual 10% rate since the late 1980s, according to the Health Care Financing Administration (HCFA) in Baltimore. As a percentage of pretax corporate profits, business expenditures for health care have increased from 8.4% in 1965 to over 50% in 1989, according to the HCFA. General Motors Corp.'s health care bill exceeded \$3 billion in 1990, after rising about 12.6% per year since 1965. Its health care costs are expected to rise 15% per year for the next several years, according to a GM official.

So it may be shocking, but not surprising, that 35% of the respondents to DATAMATION's survey reported a decrease in health insurance benefits.

Where The Grass Is Lushest...

The U.S. cities where IS employees will enjoy the highest average percentage pay increases this year:

Houston/Dallas/Ft. Worth	5.99%
Miami/Orlando/Tampa	5.86%
Washington, D.C./Baltimore	5.86%

And Where The Ground Is Barest

Los Angeles	4.70%
Boston	5.12%
New York City	5.23%

SOURCE: DATAMATION 1992 Salary Survey

Which Sectors Are Hot...

The sectors that are giving the largest raises this year:

DP Services	6.67%
Other Industries	5.95%
Nonbanking Financial Services	5.78%

And Which Are Not

Transportation	4.63%
Banking	4.79%
Manufacturing/Industrial Goods	5.21%

SOURCE: DATAMATION 1992 Salary Survey

Whether these rollbacks take the form of larger monthly payroll deductions, higher deductibles or more stringent restrictions, reduced health care benefits are taking an unwelcome bite out of a paycheck that will probably not increase that much this year in any case.

Some major companies are fine-tuning their health-care coverage even as they plead to government officials to institute national health insurance. The Gillette Co. recently adopted a plan to require employees to pay for retirement health care insurance, according to an official at the Boston-based shaving-products company. Ciba Corning's employees saw a small increase in their premiums this year, as did Brown & Root's.

Corporate training is expanding at many companies, due in part to the rapid appearance and growing importance of new technologies like object-oriented programming and client/server architecture. "Our training budget is up 20% a year for past two or three years," says Al Risdorfer, director of human resource planning and development at Computer Sciences Corp.'s Waltham, Mass. office. He explains that the company is making a major investment to upgrade its staff's management and technology skills.

Some enlightened companies take the point of view that retraining existing personnel in the new technologies like distributed processing is more cost-effective. "We eschewed the notion of bringing in paid mercenaries and running the risk of creating a schism between haves and have-nots," says Charles Schwab's CIO Mark Barmann. "In most cases, we're going with our own people, and we're willing to shoulder the additional expense of their retooling."

Technical awards can be a compensation-based mechanism to encourage innovative thinking and

(Continued on page 44)

Salary Averages By Location (in \$)

Title	Weighted Average	Boston	New York City	Wash. D.C./ Baltimore	Chicago	Dallas/Ft. Worth Houston
IS MANAGEMENT						
CIO/VP	\$117,082	115,624	128,979	102,804	120,000	133,205
Director	80,925	79,081	88,695	79,202	82,972	77,031
Manager/Supervisor	57,113	55,000	69,062	57,419	57,102	54,701
Data Center Manager	59,289	56,625	77,159	57,090	60,614	59,239
END-USER SUPPORT						
Manager End User Computing	52,677	50,769	53,939	55,000	50,500	57,750
Information Center Manager	54,285	61,176	68,636	49,500	53,478	52,250
PC Specialist/Support	37,867	39,531	44,111	38,363	36,698	35,900
LAN Manager	46,716	54,250	53,181	45,416	45,769	45,500
WP Supervisor	36,323	31,000	40,714	39,062	34,375	35,000
SYSTEMS ANALYSIS/PROGRAMMING						
Manager Systems Analysis and Programming	62,902	66,176	69,777	60,612	63,586	63,690
Senior Systems Analyst and Programmer	51,201	51,190	57,441	51,428	48,968	50,338
Systems Analyst and Programmer	42,515	45,750	47,428	41,636	41,551	42,627
Intermediate Analyst and Programmer	37,355	42,884	44,137	36,250	36,341	37,857
Junior Analyst and Programmer	30,218	28,750	41,666	27,272	28,871	31,111
APPLICATION/OPERATING SYSTEMS PROGRAMMING						
Manager Applications/Operating Systems Prog.	65,778	64,807	83,593	61,666	69,193	62,258
Senior Applications/Operating Systems Prog.	53,491	51,400	68,392	51,097	52,297	49,324
Applications/Operating Systems Prog.	43,965	51,521	54,230	41,785	40,857	41,800
Intermediate Applications/Operating Systems Prog.	38,382	35,384	56,153	36,029	38,333	36,785
Junior Applications/Operating Systems Programmer	30,136	33,181	49,090	28,750	22,857	31,666
DATA COM/TELECOM/CONNECTIVITY						
Network Manager (LAN - WAN)	58,062	56,842	69,464	57,794	62,826	48,823
Telecommunications Manager	58,457	55,666	65,555	61,093	69,722	58,000
Communications Specialist	42,662	39,062	48,541	42,027	41,250	42,647
DATABASE						
Database Manager/Administrator	59,731	52,586	68,225	56,739	56,612	51,785
Database Analyst	47,643	43,529	61,521	44,852	47,045	45,357
Microcomputer/Workstation Manager	44,141	53,333	45,357	44,772	51,000	40,000

Salary Averages By Segment (in \$)

Title	Weighted Average	Manufacturing (Consumer)	Manufacturing (Industrial)	Banking	Financial Services
IS MANAGEMENT					
CIO/VP	\$117,082	132,962	106,785	141,136	134,456
Director	80,925	83,333	81,585	107,631	85,000
Manager/Supervisor	57,113	59,285	55,769	70,192	62,500
Data Center Manager	59,289	56,666	53,593	80,681	68,953
END-USER SUPPORT					
Manager End User Computing	52,677	51,785	55,882	70,454	60,535
Information Center Manager	54,285	41,818	49,000	62,500	62,954
PC Specialist/Support	37,867	37,600	37,580	40,000	39,285
LAN Manager	46,716	41,250	45,294	56,818	53,166
WP Supervisor	36,323	40,000	35,000	37,500	42,727
SYSTEMS ANALYSIS/PROGRAMMING					
Manager Systems Analysis and Programming	62,902	66,250	57,068	78,958	64,743
Senior Systems Analyst and Programmer	51,201	46,428	49,021	60,869	52,800
Systems Analyst and Programmer	42,515	41,216	41,714	48,157	43,837
Intermediate Analyst and Programmer	37,355	36,666	38,125	38,928	42,432
Junior Analyst and Programmer	30,218	27,307	27,812	28,000	37,173
APPLICATION/OPERATING SYSTEMS PROGRAMMING					
Manager Applications/Operating Systems Prog.	65,778	64,166	65,238	84,117	80,000
Senior Applications/Operating Systems Prog.	53,491	50,312	54,000	70,357	64,333
Applications/Operating Systems Prog.	43,965	40,882	42,857	55,416	51,600
Intermediate Applications/Operating Systems Prog.	38,382	36,250	38,846	47,500	45,294
Junior Applications/Operating Systems Programmer	30,136	22,500	28,000	35,714	41,111
DATA COM/TELECOM/CONNECTIVITY					
Network Manager (LAN - WAN)	58,062	58,333	55,357	81,000	67,500
Telecommunications Manager	58,457	52,000	59,285	76,153	65,217
Communications Specialist	42,662	40,000	42,142	51,388	42,400
DATABASE					
Database Manager/Administrator	59,731	56,764	60,555	75,416	71,200
Database Analyst	47,643	43,461	50,555	60,000	53,043
Microcomputer/Workstation Manager	44,141	40,000	40,000	49,000	55,454

Salary Averages By Company Revenue

San Francisco	Los Angeles	Tampa/Oriando/ Miami	Weighted Average	(\$ Millions)				
				1-249	250-499	500-4,999	5,000-19,999	20,000+
106,060	115,000	113,098	\$117,082	92,840	107,656	115,045	129,302	199,242
86,555	87,386	75,377	80,925	70,031	73,492	80,312	92,627	100,999
58,939	62,264	51,198	57,113	52,042	55,434	57,716	62,288	69,230
55,394	62,121	51,486	59,289	47,168	58,255	60,661	66,754	74,342
53,333	55,238	48,750	52,677	48,474	44,821	54,166	54,875	62,800
55,833	50,357	48,947	54,285	50,000	48,333	54,166	58,333	59,791
42,763	39,210	33,350	37,867	36,343	36,538	38,159	41,914	41,500
49,807	47,500	39,711	46,716	42,413	44,615	47,500	51,818	49,642
37,000	31,000	35,000	36,323	37,000	38,125	35,781	34,750	38,000
67,580	62,258	56,250	62,902	61,804	59,838	60,461	67,454	69,210
58,431	58,214	43,990	51,201	50,387	52,129	50,093	52,177	55,384
46,071	43,857	38,225	42,515	42,519	40,918	42,187	43,000	44,594
37,096	38,043	32,627	37,355	36,730	38,000	36,648	39,100	39,117
30,769	31,666	26,562	30,218	29,897	27,400	30,506	32,750	29,444
67,037	65,625	57,800	65,778	57,543	62,678	64,722	74,300	74,242
59,807	56,250	48,103	53,491	50,373	51,785	51,161	58,076	58,181
47,105	45,714	38,163	43,965	44,310	40,681	40,937	47,291	47,166
38,235	41,000	34,375	38,382	34,428	30,625	39,666	40,810	42,777
29,500	30,625	25,000	30,136	27,884	26,071	30,555	36,190	31,250
55,789	64,285	50,405	58,062	46,976	51,470	57,388	63,088	75,172
53,571	70,000	47,333	58,457	52,333	52,000	57,222	65,945	64,464
49,821	45,250	36,739	42,662	40,789	46,739	41,089	43,139	44,516
62,884	61,338	49,687	59,731	51,642	56,538	55,813	61,162	64,666
46,250	53,928	42,000	47,643	42,432	43,529	49,732	47,073	53,043
43,461	45,000	36,052	44,141	40,000	45,769	44,629	43,571	46,176

DP Services	Distribution (Wholesale/Retail)	Government	Medical/ Legal	Transportation	Education	Construction	Other
112,638	116,176	89,761	103,636	131,250	86,041	106,666	130,241
78,571	86,428	75,548	77,083	88,387	63,437	70,555	83,483
56,935	53,076	55,864	47,972	61,500	49,358	54,444	5,969
56,000	56,279	57,089	54,375	70,714	45,689	49,285	56,388
52,916	42,750	53,260	50,937	63,076	45,217	40,000	49,893
56,111	62,000	53,690	54,000	63,666	40,937	40,000	50,208
42,173	38,906	38,400	36,379	41,956	34,242	45,833	35,125
45,357	49,375	46,759	42,647	48,823	40,000	40,000	45,714
31,428	35,000	35,862	28,000	44,285	37,857	32,500	34,545
62,307	60,312	60,258	58,750	66,000	53,448	63,750	65,491
50,416	48,522	51,666	45,172	50,645	44,705	43,000	58,714
41,500	43,690	42,671	40,714	44,687	36,896	40,000	42,898
33,888	33,076	34,905	37,500	39,423	34,000	35,000	40,000
29,285	25,652	29,333	31,923	34,285	29,615	32,500	28,947
65,714	62,631	61,734	57,187	70,714	53,125	62,500	63,452
53,000	50,833	51,481	48,611	56,458	44,772	52,857	49,777
43,750	40,833	41,836	41,363	43,913	34,166	40,000	47,999
38,636	38,500	35,657	40,000	43,750	31,428	25,000	35,000
26,875	23,500	28,888	35,000	36,785	27,142	32,500	29,000
55,769	57,083	57,093	49,333	60,333	49,473	40,000	58,958
51,538	63,214	55,000	61,250	61,111	47,812	51,250	57,511
40,000	43,000	40,937	38,636	45,000	35,263	47,500	46,029
54,473	52,187	53,584	53,333	60,217	46,428	47,500	52,272
44,090	45,000	46,666	48,571	47,857	40,000	40,000	43,620
41,875	49,000	45,357	36,250	53,500	32,500	40,000	36,250

SPECIAL REPORT

SALARY SURVEY

the use of new technologies. CSC's program, now in its fourth year, recognizes individuals who have made an outstanding technical breakthrough in the last 12 months, according to Pete Gross, vice president for CSC's Corporate Technology Center in Falls Church, Va. Five to eight staffers receive \$5,000 (tax-free), and 12 finalists receive \$1,000 from a pool of 60 or 70 nominees out of the firm's 18,000 programmers, analysts and other IS staff members. Recent \$5,000 winners included a developer of a large software system built for the National Aeronautics and Space Administration that contained 85% reusable code.

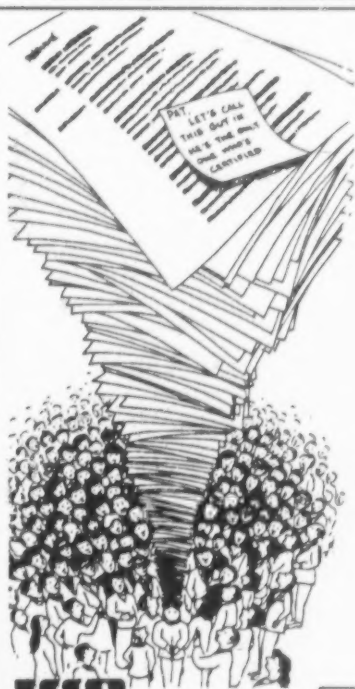
Less encouraging is the small number of companies that offer help to parents needing day care for their children. Only 9.6% of those who filled out the DATAMATION survey said that their companies offered on-site child care facilities; 11% provide some form of child care reimbursement. A 1991 study of U.S. companies by the Jersey City, N.J.-based management consulting firm Hay Group found that only 16% provided employer-funded child care. The study projects that that number will grow, however, as more companies adjust their benefit programs to respond to their employees' family-based needs. Although Brown & Root increased its employees' health

insurance costs slightly this year, it opened a new day-care center for 109 employee children, as well as a well-equipped fitness center. Both facilities have been a "big employee draw and help keep them here," says recruiter Curd. In the ongoing push and pull of employee benefits, watch for continued pressure for additional corporate support of day-care options. ■

Kate Colborn is a Center Harbor, N.H.-based writer who covers technical career issues.

Methodology

The data for the DATAMATION Salary Survey are based on a questionnaire sent in May by Cahners Publishing Co.'s Research unit to more than 8,600 IS managers who subscribe to DATAMATION. More than 900 recipients from 12 user-sectors completed the four-page questionnaire, which included 25 job titles and 22 types of benefits. For more information about the survey, contact Cahners Research at (617)-964-3030.



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DTM

MANAGEMENT

ECONOMIC TRENDS

Born To Buy Computers

DATAMATION's Information Systems Performance Indicator (ISPI) continues its 1992 trend upward, ever upward. New orders received by U.S.-based information system suppliers in March jumped to \$10.5 billion, up 17.8% from the previous year. It was the third-highest monthly total ever recorded.

In April, orders climbed 11.7% higher than they were in the same month of the previous year. This boost, along with the gain in average weekly hours for computer industry employees, nudged the ISPI to 96.54 in April. Based on information available at press time, we estimate the indicator will reach 103.5 this month.

Over the remainder of 1992, increases in new orders will continue to feed growth in the ISPI, as demand for computers, peripherals and communication equipment strengthens.

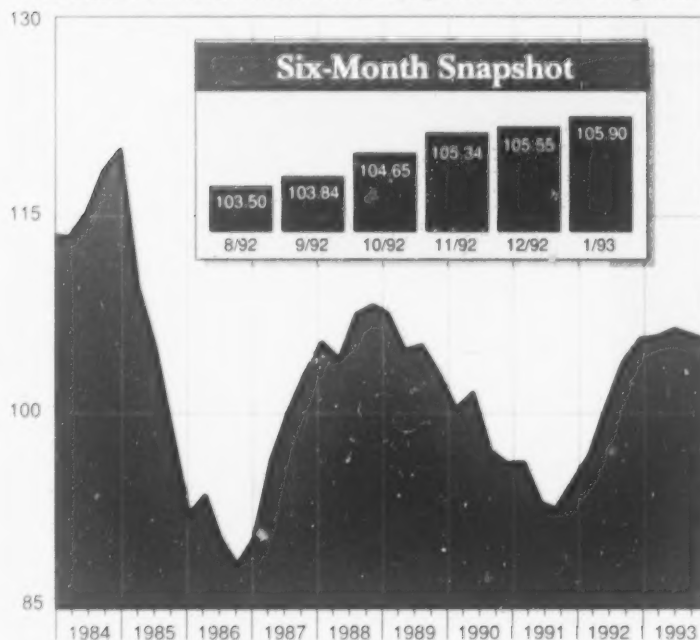
In the first quarter of 1992, U.S. business purchases of computers and peripherals reached an annualized \$41.3 billion—a gain of 3.5% over the previous quarter's level and 12.9% higher than the same period of the previous year. On top of that, U.S. companies bought \$63.4 billion worth of communication equipment, on an annualized basis, in the first quarter of '92.

Cahners Economics's business surveys on capital spending plans confirm the growing appetite for new equipment. In November of last year, the capital-spending index seemed frozen at 55.4. But, by April 1992, that index had steadily edged up to 59.3. Since purchases of computers, peripherals and communication equipment account for 26 cents of every dollar spent on capital equipment, the IS industry can expect continued growth in demand for equipment this year.

Eg Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services, including seminars, newsletters, and database diskettes, contact Dan Ruchan at (617) 639-2105.

The IS Performance Indicator

Increases in new orders will continue to feed growth as demand strengthens.



*Shaded area denotes forecast

	Last Month	Prev. Month	% Change	Year Ago	% Change
■ Information-Processing Equipment					
Shipments (SA, \$ billions, April)	10.45	10.49	-0.4	9.36	11.6
New Orders (SA, \$ billions, April)	9.96	10.50	-5.2	8.92	11.7
Unfilled Orders (SA, \$ billions, April)	24.77	25.26	-1.9	28.08	-11.8
Inventory (SA, \$ billions, April)	14.94	14.96	-0.1	16.16	-7.5
■ Computer Production Workers					
Employment (NSA, thousands, April)	245.2	246.0	-0.3	267.2	-8.2
Average Weekly Hours (monthly avg., April)	41.4	42.0	-1.4	39.8	4.0
■ Stock Index (May)					
S&P's Computer Systems Stock Price Index	155.1	149.6	3.7	172.55	-10.1
■ Contracts & Orders (March)					
New Plant & Equipment (SA, \$ billions)	37.0	35.4	4.6	35.94	3.0

SA = Seasonally Adjusted
NSA = Not Seasonally Adjusted

Source: U.S. Commerce Dept., Standard & Poor's
Forecasts Cahners Economics

Source: DATAMATION, Cahners Economics

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

SEPTEMBER 1, 1992

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president,
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has a gauge on performance

DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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Making The Best Mainframe Deal

How can you cut your large systems costs? Information is the secret to striking bargains on big-ticket hardware and software.

The mainframe market stinks on ice. IBM and its plug-compatible manufacturer (PCM) competitors Amdahl Corp. and Hitachi Data Systems Corp. brawl like starving hyenas over scraps from the market carcass, their margins cut to marrow. A mainframe fire sale is on, or so it seems.

Weird it is, then, that even amid the carnage, many companies still pay too

BY NED SNELL

much for mainframe materiel. According to market researcher Xephon Technology Transfer Ltd. of Newbury, U.K., as much as 90% of buyers worldwide pay more than they have to for some mainframe models. "P.T. Barnum was right," says Jim Cassell, vice president/service director, large

computer strategies, at the research firm Gartner Group Inc. in Stamford, Conn. "There are suckers out there that are paying close to list price."

The difference between the suckers and the savvy is information—on market principles and market values, and on negotiating strategies that have saved the savvy millions.

For starters, list price—for main-

Unveiling The Street Prices

Use this guide to determine what you should be paying for mainframe MIPS. Mainframe performance and market prices are projected through the year 2000. For IBM's largest mainframes, price per MIPS decreases 15% each year, while system performance (measured in number of MIPS) increases 35% every year.

Year	Street Price Per MIPS	Largest System (in MIPS)	Street Price Of Largest System	Year	Street Price Per MIPS	Largest System (in MIPS)	Street Price Of Largest System
1985	\$181,000	27	\$4,887,000	1993	49,321	298	14,691,424
1986	153,850	36	5,607,833	1994	41,923	402	16,858,409
1987	130,773	49	6,434,988	1995	35,834	543	19,345,024
1988	111,157	66	7,384,148	1996	30,289	733	22,198,415
1989	94,483	90	8,473,310	1997	25,746	989	25,472,682
1990	80,311	121	9,723,124	1998	21,884	1,336	29,229,902
1991	68,264	163	11,157,284	1999	18,801	1,803	33,541,313
1992	58,024	221	12,802,984	2000	15,811	2,434	38,488,657

Note: MIPS calculations have been rounded to the nearest whole number. Street price calculations are based on unrounded MIPS figures.

Source: Xephon Mainframe Market Monitor



frames as for Buicks and beach-houses—means very little. For example, IBM's top-of-the-line water-cooled ES/9000 lists for \$23.5 million. That box "will sell at the moment for anywhere from 18 to 12 million dollars, for identical configurations," says Barry Graham, an independent consultant to the "Mainframe Market Monitor," a newsletter and information service published by Xephon. Based on polls of its international circulation of 500 mainframe buyers, the newsletter prints the actual street prices paid for mainframe computers and peripherals, and it offers advice for making the best deal. Similar data are available from the Gartner Group. Without such information, says Graham, buyers are likely to pay too much.

After having learned the current street price per million instructions per second (MIPS) for mainframe processors, CPU buyers should chart a curve reducing that price by 15% per year and post the chart on the wall. Then MIS managers should make sure future purchases stick to that curve, advises Graham, a former executive of UNIVAC, IBM and Hitachi Data Systems. By following the 15% rule—which has reliably reflected actual selling prices since the 1970s—buyers can avoid being snowed by "discounts" whose numbers look good but still yield a selling price out of line with market value.

"This is the worst supply/demand imbalance in the high end we've ever seen."

IBM business practices management director Art Cohen challenges such "commodity-based" pricing models, pointing out that feature distinctions, package discounts and even differences in vendor-provided services and expertise affect the actual value of a purchase and thus the price the buyer should pay. Such factors don't fit in cost-per-MIPS equations, Cohen says.

Every customer's needs are different, Cohen adds. "Some people might

Watch Those Software Costs!

Software license and maintenance fees now consume as much as 40% of large IS budgets, according to M. Victor Janulaitis, chief executive officer of Positive Support Review Inc. (PSR), a Los Angeles-based management consulting firm. And Janulaitis says many big shops could save plenty by keeping a better eye on their software costs.

Janulaitis's mainframe clients have swallowed big bills lately when cash poor software vendors suddenly began invoicing for software that they had previously provided free. A more common vendor tactic is to hook customers with a big initial discount—\$20,000 for software that lists for \$250,000, for example—only to charge 20% of list—\$50,000 per year—for maintenance after the warranty runs out. An unwary buyer might wrongly assume that maintenance was 20% of the selling price, or \$4,000.

In PSR's newsletter, "PSR Review," Janulaitis writes that the key to avoiding such traps is careful software inventory management—something few shops do. He advises clients to keep accurate and complete license inventory records—even on supposedly "free" software or software bundled with hardware—and to keep a careful eye on vendors' tiered-pricing schemes, to anticipate charges at upgrade time.

"The biggest mistake that people will make is that they will upgrade a processor and just upgrade the software along with it," says Janulaitis. "It may be cheaper, depending on how the tiered pricing is done by the hardware vendor, to buy a smaller box to run this application on than paying the next increment in cost for a software license for the larger box."

buy a house and pay more because it's a corner lot. . . There are so many different aspects that make each transaction so unique, that you can't get to a number that relates to the price of the product," he argues.

But even ignoring the 15% rule and starting with the vendors' list prices, clever buyers can find advantages. For example, consultant Graham says buying a secondhand mainframe model you don't want and then upgrading to the model you do want can be cheaper than buying what you want outright—even if you pay full list price for the upgrade.

For example, a secondhand IBM ES 9000 model 720 runs about \$3 million, and the list price to upgrade from the 720 to the 900 is \$10 million. A total of \$13 million buys a new computer that lists for \$23.5 million. "Any user who pays more than \$13 million is frankly off his mind," says Graham. He adds that buyers don't actually have to implement that strategy; just knowing they have the option gives them a valuable bargaining chip.

A more traditional method of getting

a good price is taking competitive bids from IBM and its PCMs—a tactic Graham considers essential. But Gartner's Cassell says IBM does not take all such competitions seriously.

When he was an IBM manager, he says, "salesmen would come in with their tin cup and say, 'I need extra discount,' and the first question I'd ask is, 'Has this guy ever bought a non-IBM box?' If the answer was no, I'd say, 'What makes you believe he's going to do it this time?'" To play the competitive bid card, "you have to demonstrate that you're serious," says Cassell. "You can put out competitive bids, but if you continue to award them to IBM, then IBM doesn't believe you and neither does Amdahl or Hitachi. You have to install a non-IBM product."

Michael Simmons, executive vice president at The First National Bank of Boston Corp., says no such hardball tactics are necessary if you've established a good business relationship with your supplier. Having learned the best market price from information services like Xephon or Gartner or sim-

MIDRANGE/MAINFRAME

PRICING

ply through a peer network, you sit down with your principal supplier and say, "Look, I need your sharpest pencil, your best price," says Simmons. "If I can't get it, you force me to go to commodity-type bidding. Do you want to enter into that bidding war?"

Then, if the vendor brings back too high a price—showing he doesn't take you seriously—you take the competitive bids. That way, "They'll only do it once," says Simmons. "The neat thing about being honest with them is that if they're not honest back with you, they lose. It's a game of liar's poker where you lose if you lie."

Often, the vendor is willing to offer competitive prices without the pressure of open bidding in exchange for exclusive supplier rights for a limited term. As long as the price is right, such deals can save buyer and seller time, money and hassles.

In fact, IBM encourages such deals, offering so-called "unified pricing" arrangements to big buyers like Mobil Oil Corp. and Sears, Roebuck and Co., un-

der which these companies commit 80 to 90% of their spending to IBM for a fixed period in exchange for roughly a 5% total discount. The PCMs have yet to respond publicly with similar deals—which would be difficult for them to make, says Cassell, since they haven't IBM's broad range of hardware (including PCs) and software to bundle. IBM's Cohen, however, says the deals don't necessarily give Big Blue an edge: "Most of our competitors can put together packages of offerings that are equivalent to ours, whether it's their own products or someone else's."

For the foreseeable future, knowledgeable buyers should be able to strike good—even amazing—deals, since the vendors are committed to selling as many units this year as last, despite tepid demand and more powerful, more costly units. "This is the worst supply/demand imbalance in the high end we've ever seen," says Cassell. That's bad for sellers, but good for buyers who arm themselves with the right information. ■

Savings Tips For Moneywise Buyers

- Keep track of street prices through research reports and peer networking.
- Don't be impressed with big percentage discounts off list—the resulting selling price may still be too high.
- Solicit competitive bids.
- Don't resign yourself to paying a premium on new models.
- Investigate creative strategies, such as buying used equipment and then upgrading.
- For overseas companies buying U.S. hardware, consider buying in the States (where prices can be lower) and shipping.
- Delay purchases as long as possible—selling prices are falling.
- Bargain hard—it's a buyer's market.

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Asia's IT Profits Tumble, Despite Revenue Rise

As the Asian economic bubble has burst, And IT profits have gone with it. Asian IT vendors are looking for ways to survive in a demanding economic climate.

When the Asian economic bubble burst, it was a shock to the system. The region's IT industry, which had been thriving for years, suddenly found itself in a demanding economic climate. Asian business executives are a lot like their U.S. and European counterparts: When times get tough, they cut capital spending. As the recession has forced them to pore over balance sheets in search of places to cut costs, many have decided to postpone their investment back on their information technology spending. The top 25 Asian IT vendors found that out the hard way in 1991. As the worldwide recession took a firm grip on the Asian market, many once-thriving vendors experienced drastically reduced earnings. Although DATA-cube's top 25 Asian information systems vendors reported revenue growth of 17.7% (in dollar terms) to \$82.5 billion in 1991, their earnings plummeted an estimated 38%. Earnings for the top 25 Asian IT firms dropped 46%.

Japan, where an ever-expanding bubble economy had led to unprecedented prosperity and increases in IT spending, was no exception. Through the 1980s, growth suddenly slowed. The Japanese economy grew by just 3.5% in fiscal 1991 compared to 1990's 5.5% growth. Corporate and personal

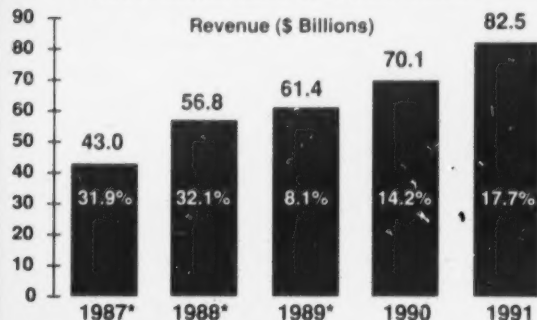
spending on IT products and services has been cut. The top 25 Asian IT vendors found that out the hard way in 1991. As the worldwide recession took a firm grip on the Asian market, many once-thriving vendors experienced drastically reduced earnings. Although DATA-cube's top 25 Asian information systems vendors reported revenue growth of 17.7% (in dollar terms) to \$82.5 billion in 1991, their earnings plummeted an estimated 38%. Earnings for the top 25 Asian IT firms dropped 46%.

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Revenue On The Rise

Asia's 25 largest IT suppliers managed double-digit growth despite some poor profit returns.



* Top 25 Asian figures are estimates.

BY JEFF MOAD

The DATAMATION Asian 25

ASIAN RANK 1991	1990	COMPANY	1991 IS REVENUE	1990 IS REVENUE	IS REV. % CHANGE	NATIVE CUR. % CHANGE	TOTAL REV.	IS AS % OF TOTAL	NET INCOME	FISCAL YR. END
1	1	Fujitsu	19,516.7	14,196.2	37.5%	27.7%	25,590.7	76.3%	90.8	March
2	2	NEC	16,171.0	13,404.7	20.6%	8.1%	28,052.0	57.6%	113.0	March
3	3	Hitachi	11,167.3	9,604.1	16.3%	8.0%	57,739.8	19.3%	951.7	March
4	4	Toshiba	4,996.3	5,055.9*	-1.2%	8.2%	35,110.7	14.2%	293.6	March
5	5	Matsushita	4,769.2	4,101.8	16.3%	8.0%	55,389.6	8.6%	988.1	March
6	6	Canon	4,373.7	3,535.3*	23.7%	14.9%	13,895.3	31.5%	387.8	December
7	7	NTT Data	2,936.1	2,382.0	23.3%	14.5%	2,936.1	100.0%	37.7	March
8	8	Ricoh	2,548.4	2,331.3	9.3%	1.5%	7,564.4	33.7%	15.2	March
9	9	Nihon Unisys	2,528.1	2,241.4	12.8%	4.8%	2,528.1	100.0%	24.3	March
10	10	Oki	2,387.8	2,137.8*	11.7%	3.7%	5,065.3	47.1%	-3.6	March
11	11	Mitsubishi	2,178.4	1,830.1	19.0%	10.6%	19,412.6	11.2%	219.3	March
12	13	Seiko Epson	1,572.5	1,447.5*	8.6%	0.9%	3,494.4	45.0%	29.7	December
13	15	Nomura	861.0	832.9*	3.4%	-4.0%	1,000.4	86.1%	N/A	March
14	N/A	Samsung	835.7	800.0	4.5%	8.2%	7,127.8	11.7%	94.1	December
15	18	Sony	830.5	756.2*	9.8%	2.0%	28,413.2	2.9%	893.1	March
16	14	Acer	814.9	751.0	8.5%	8.5%**	985.2	83.0%	-22.7	December
17	16	Tatung	667.3	593.4	12.5%	12.2%	1,984.0	33.6%	18.2	December
18	17	CSK	650.9	527.2	23.5%	14.7%	669.6	97.2%	38.7	September
19	21	Intec	504.2	402.7	25.2%	16.3%	504.2	100.0%	15.7	March
20	N/A	C. Itoh	484.8	416.4*	16.4%	8.0%	589.6	82.2%	N/A	March
21	23	Alps	394.1	384.1	2.6%	-4.5%	8,921.9	4.4%	N/A	March
22	20	Mitac	373.6	394.0*	-5.2%	-5.2%**	540.0	69.2%	2.0	December
23	22	Goldstar	337.6	287.2*	17.5%	21.8%	5,018.4	6.7%	25.9	December
24	N/A	Trigem	318.5	227.8	39.8%	45.0%	318.5	100.0%	3.3	December
25	24	Omron	298.6	291.3	2.5%	4.8%	3,592.9	8.3%	45.9	March

* Restated figure ** Reported in \$US N/A= not available
All revenue figures are in \$ millions, based on the company's fiscal year.

bankruptcies skyrocketed to their highest levels in years, and real estate and securities values plunged.

Hardest hit have been Japan's financial and retail sectors. Even among Japan's previously impervious 11 giant commercial banks, pretax profits fell by an average 14% during the last fiscal year due to bad loans and losses in securities and real estate markets.

As a result, the same financial services companies that spent heavily on information technology through the 1980s suddenly cut back. International Data Corp. Japan Ltd., for example, reports that financial industry organizations in Japan grew their overall IS budgets by only 5% in 1991. That's far short of the double-digit IS budget increases many Japanese banks and securities companies were approving in the flush 1980s. IDC, in its survey of some 1,400 user sites in Japan, also found that companies in wholesale and retail industries put a lid on IT spending even more dramatically, limiting budget increases to about 2 and 3%, respectively.

"Among many companies, information technology spending is one of the first areas of capital spending to be cut when growth slows," says Akira Suzuki, general manager of strategic planning for Mitsubishi Electric Corp.'s Information and Communication Systems group. "Many managers in Japan don't know much about IT themselves. So, if they must reduce expenses, they're likely to begin by questioning the value of IT investments."

As organizations cut their IT spending, they negotiated tougher deals. Fervent competition, which forced many vendors to cut prices in an attempt to spur orders, was responsible for most of the slower earnings growth of the

vendors on DATAMATION's list.

Few vendors escaped the effects of Asia's economic slowdown. In Japan, where highly centralized user organizations have in recent years sustained growing demand for large mainframe systems at 10% per year or better, 1991 saw mainframe demand fall significantly below expectations. Although companies such as Fujitsu Ltd., Hitachi Ltd. and NEC Corp. began shipping major new upgrades to their large-scale product lines, mainframe sales languished.

Japanese mainframe demand seemed robust compared with demand in some other Asian markets, however. Mainframe orders in Australia, for example, plunged with the recession. IDC estimates that Australia's mainframe market shrank by 35% in 1991.

In such a depressed market, discounting was heavy. "We're seeing mainframe vendors offering discounts of up to 30%. And that's on top of similar discounts offered in 1991," reports Barry Dargan, head of research in the Tokyo office of the James Capel Pacific Ltd. securities firm.

The impact on the financial results of the top mainframe vendors was predictable. Fujitsu saw its net earnings in fiscal 1991 drop 85.2%. NEC's net fell 72%. And Hitachi Ltd. saw its net income drop 45%. PC makers didn't fare much better. As PC sales slowed in much of the rest of the world, they actually dropped in Japan, hurting most PC vendors, but especially domestic firms. The Japan Electronics Industry Association estimates that Japanese vendors sold 1.9 million PCs worldwide in 1991, down 7.8% from the 2.1 million that were sold in 1990. The estimated value of PCs shipped by

Leading Japanese vendors have so far failed to agree on PC hardware and software standards for the domestic market.

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Japanese vendors in 1991 dropped by 3%. Of PC vendors, only Apple Computer Inc. fared well in Japan, doubling its shipments to 130,000 units, according to IDC.

Vendors blamed several factors for the 1991 slump in PC sales. Tighter IS budgets have certainly damaged PC demand. But in Japan a lack of PC standards has also taken a toll. Leading Japanese vendors such as Fujitsu and NEC, which holds more than 50% of the market, have so far failed to agree on PC hardware and software standards for the domestic market. That has delayed the arrival of important new types of PC applications that could help expand the market. Microsoft Corp.'s Windows graphical user interface is only now gaining momentum in Japan, for example, as is Novell Inc.'s NetWare network operating system. In fact, IDC estimates that only about 15.6% of PCs in Japan are networked today versus 44.2% in the United States.

A lack of PC standards in Japan also has kept prices high compared with the rest of the world. Although Japanese users have begun to see some PC price reductions already, vendors acknowledge they'll have to accelerate that trend if they hope to reinvigorate PC sales.

"In order to achieve [market share increases], I believe we have to cut down the prices of our new models even more," says Fujitsu president Tadashi Sekizawa. "So we have to make efforts to bring down our costs."

Asian PC vendors outside Japan also suffered through 1991. Although 1991 GNP and IT-spending growth in countries such as Korea and Singapore remained fairly healthy compared with Japan, vendors there faced severe pricing pressure thanks to slowing markets in the rest of the world.

"Having based their PC strategies on overseas OEM sales, a lot of the companies in Taiwan and Korea were faced with a glut of systems when worldwide markets slowed down," says Davis Blair, director of Asian research for IDC in Hong Kong. "For that reason, they started to look to their home markets to absorb that overcapacity. That led to intense pricing competition."

Such competition depressed the results of larger vendors such as Acer Inc., Hyundai Electronics Industries Co. Ltd. and Mitac International Corp. and forced several second-tier PC vendors out of the market.

Despite the current pressures facing non-Japanese Asian vendors, analysts expect the Asian market outside Japan to post steady growth in the long term. IDC Japan predicts that the portion of spending that takes place outside Japan will grow from 18% in 1990 to about 22% in 1995 or about \$17 billion. Outside Japan, the fastest growing IT markets are expected to be Thailand with 23% growth between 1990 and 1995, Korea and Malaysia with 19%, Taiwan with 15% and Singapore with 14%, according to the IDC figures.

The DATAMATION Asian 25 By Technology

		1991 IS REVENUE	MAIN- FRAMES	MID- RANGES	PCs	WORK- STATIONS	SOFT- WARE	PERI- PHERALS	DATA- COM	SERVICES	MAINTENANCE	OTHER
1	Fujitsu	19,516.7	4,486.8	2,634.8	2,342.0	1,366.2	2,535.3	3,025.1	585.5	1,368.0	1,171.0	
2	NEC	16,171.0	3,234.2	2,096.7	4,187.8	161.7	1,933.1	2,104.1	319.7	646.8	892.2	594.8
3	Hitachi	11,167.3	3,977.7	408.9	877.3	223.0	966.5	3,345.7	446.1	408.9	297.4	215.8
4	Toshiba	4,996.3		1,301.1	2,044.6	312.3		713.8	624.5			
5	Matsushita	4,769.2			202.8	1,048.3		2,044.6	1,189.6		283.9	
6	Canon	4,373.7			612.5			3,139.0		622.2		
7	NTT Data	2,936.1							1,761.7	1,174.4		
8	Ricoh	2,548.4			408.9		126.4	609.7	1,152.4		130.0	121.0
9	Nihon Unisys	2,528.1	983.4	141.6	134.0	93.5	609.3				285.7	280.6
10	Oku	2,387.8		96.7	111.6		178.4	1,382.9	408.9		209.3	
11	Mitsubishi	2,178.4	198.3	459.6	242.4			727.2	550.9			
12	Seiko Epson	1,572.5			707.6			864.9				
13	Nomura	861.0								861.0		
14	Samsung	835.7		27.0	198.9	10.0		599.8				
15	Sony	830.5				390.0		440.5				
16	Acer	814.9	2.0	2.8	708.9	18.0	13.2	70.0				
17	Tatung	667.3		27.1	199.8	11.3		271.2	157.9			
18	CSK	650.9			108.6					542.3		
19	Intec	504.2					194.7		76.1	233.4		
20	C. Itoh	484.8		44.6		208.2	108.6	4.5	3.7		115.2	
21	Alps	394.1						394.1				
22	Mitac	373.6	10.0	6.0	235.0	15.0	3.0	79.6	20.0	5.0		
23	Goldstar	337.6		49.8	159.4	34.1	35.5	41.1			17.7	
24	Trigem	318.5			217.1	9.5	3.4	86.3			2.2	
25	Omron	298.6			146.1	29.1	14.4	106.5	2.5			

All revenue figures are in \$ millions

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In Japan, tight IS budgets also hammered the market for office computers, the proprietary midsize systems that in 1991 made up about 9% of the Japanese IT market, according to *Nikkei Computer*, a trade publication. The Japan Electronics Industry Association estimates that revenues from office computers were essentially flat in 1991, while the number of units shipped fell about 6%. Although some vendors, like Fujitsu, managed to grow their office computer revenues slightly, thanks to new product releases, most observers expect to see a long-term decline in the proprietary office computer market, as many users migrate to less expensive UNIX-based systems. In fact, a survey by IDC* showed that users of Fujitsu and NEC office computers believe the major issue facing them is "migrating to more modern platforms."

Faced with slow-growing IS budgets in 1991, many vendors in Japan took some immediate steps to reduce their own expenses. Fujitsu, for example, decided to cut its own capital spending by one-third in 1991. Toshiba Corp., a victim of the PC price war in the States and the slumping market in Japan, elected to reduce research and development spending by 3% while also postponing plans to open new PC-manufacturing plants.

At the same time, most vendors in Japan are taking steps to keep up with, and even stimulate, what they see as fundamental, long-term shifts among their customers away from centralized, proprietary systems to distributed, client/server architectures based on standards such as UNIX and PCs.

"Just like in the U.S., business units and end users are becoming a more powerful force within Japanese companies, and the vendors are trying to cater to them with UNIX and client/server products," says Yuji Ogino, president of IDC Japan. "Vendors also see pushing these new technologies as a way to break the recession in IT spending the same way the success of 386-based PCs and micro-to-mainframe link products did in 1986/87," he adds. Although UNIX-based systems represent only about 4% of the market in Japan today, vendors such as Fujitsu, which like its competitors introduced new commercial UNIX systems last year, say they expect UNIX revenue to grow at between 20 and 30% over the next four years. However, although a significant number of Japanese users tell researchers they're interested in both downsizing and UNIX, there's very little UNIX application software in Japanese to attract users to the new platform.

Like their counterparts in the United States and Europe, Japanese vendors also plan to attack what they

Foreign Exchange

Values of foreign currency (equivalent to one U.S. dollar) used in this year's DTM100*

Japan	¥134.5
South Korea	W733.23
Taiwan	NT26.55

* OECD average exchange rates.

see as a rapidly expanding market for IS services such as consulting and systems integration. Total hardware revenue in Japan is expected to grow by 10% annually over the next four years, IDC says, but spending on software and services will grow twice as fast. Japanese IS services providers such as CSK Corp., Nomura Research Institute Ltd. and NTT Data Communications Systems Corp. all reported healthier growth

in 1991 than did hardware-oriented vendors. Companies like NTT Data, however, are seeing increased competition from hardware vendors. "Because they don't see substantial growth in their hardware business, those vendors are trying to sell services. More and more, they're competing with us," says Koji Abe, executive manager at NTT Data.

"Until now, NEC has been seen as a hardware manufacturer only. Now we're looking at things from a different perspective," says NEC senior vice president Yoshihiro Suzuki. "We want to assist our customer, and we understand that hardware is just one tool. Integration and consulting services also are important."

As Asian vendors try to fight off the effects of the recession by recasting their businesses in favor of UNIX, client/server computing and services, they face some challenges. Large hardware vendors such as Fujitsu and NEC, for example, will have to convince customers that they're not just trying to push their own hardware but that they're willing to provide top-notch service and support regardless of the platform.

While they wait for new markets and strategies to take off, Asian vendors are hoping for a quick end to the recession and a return to something close to the bubble economy of the 1980s. The Japanese government is optimistically predicting that GNP growth in fiscal 1992 will match last year's 3.5%. If that happens, vendors in Japan say customers who've been postponing buying decisions could finally begin to place orders and alleviate some of the competitive pressures among vendors. Many observers, however, believe predictions of a quick if moderate Asian recovery may be overly bullish.

"Very few people believe in the government's GNP estimates," says Capel's Dargan. "Two percent or less is probably more accurate."

If the overall confidence levels of business executives in Japan is any indication, IT vendors there will have to wait at least until next year for a recovery. Sadly, the recently published results of a closely watched Bank of Japan quarterly survey showed business executives' confidence in the economy at a five-year low.

Many observers believe predictions of a quick if moderate Asian recovery may be overly bullish.

OVERVIEW

Fujitsu's Sekizawa:

Dealing With Changing User Requirements

Fujitsu president Tadashi Sekizawa talks candidly about Fujitsu's attempt to become a truly global supplier in the face of a worldwide recession.

When Fujitsu Ltd.'s president and No. 1 operating executive, Tadashi Sekizawa, met recently with DATAMATION, he didn't seem the energetic reformer who, when he was named to run the company two years ago, had ambitious plans for Japan's largest mainframe vendor. Sekizawa had said that Fujitsu, much like its longtime rival IBM, needed quicker decision-making and less dependence on big iron. He began attempting to trim Fujitsu's bureaucracy and to emphasize PC and UNIX-based products while pushing the company's headline-catching globalization efforts.

In an interview at Fujitsu's Tokyo headquarters in June, however, the 61-year-old Sekizawa seemed pensive and subdued. He was quick to say his low-key attitude was the result of a slight cold, not a reaction to the worldwide recession. Still, it's clear that the economic downturn—or what's being called the bursting of the bubble economy in Japan—has left Fujitsu and its key Far Eastern IT competitors in less-than-robust health. Against this backdrop, Sekizawa discussed his explanation for the current slump among Japanese vendors; organizational changes he hopes will help Fujitsu cope with changing user



requirements; and the company's ongoing efforts to become a more global IT player.

Q: In the last year, you've been seeing changes in customer purchasing patterns. Large-systems buying has been off in particular. Do you believe we're seeing fundamental changes in user buying patterns? Or are these simply the results of short-term economic conditions?

A: We cannot explain the change as just one or the other. Both are having an effect. For example, in the finance industry and among security

brokers, orders declined by half between 1990 and 1991....The majority of the changes came from the stock market downturn. In larger industries such as [manufacturing], the orders for our largest systems have not been canceled but postponed. But we are seeing some structural changes....For example, for their branch systems, [customers] are increasingly going for UNIX systems because they think those systems are more cost-effective.

However, it is obvious that they cannot replace their mainframes with client/server UNIX systems right now because they [UNIX-based systems] lack functions such as security and other requirements. But they're starting the transition....So Fujitsu has to offer those customers a kind of road map including transition support and the best possible technologies.

Q: Several of your larger competitors such as IBM and NEC Corp. have tried to make fundamental changes in their organizations to keep up with the structural changes taking place in the industry. What is Fujitsu doing with its organization?

A: Of course we are considering major organizational changes to address structural changes. Some of them have already been implemented. And some of them will come later. But

my feeling is that reorganizing to only address vertical industries or along product categories [is inadequate]. We have to have both approaches. We have to have some sort of matrix organization....But we cannot implement these changes overnight.

Q: *In the last few years, Fujitsu has made several major steps to become a more global company. What are you trying to accomplish with your acquisitions of ICL PLC and other international investments?*

A: In 1989 almost 80% of our revenue was from the domestic market. It is clear that we cannot survive in the 1990s with only the domestic market. In going global, it is insufficient to try to sell products developed for the Japanese market. So we have to find partners which we can trust. That is our policy. With those partners we have to generate synergies in research and development, mutual product supply, marketing, exchange of people.

Q: *You've had some long-term experience with Amdahl Corp. Where have you made the most progress in attempting to establish these synergies?*

A: In our past relationship with Amdahl, of course the main benefit was in the sharing of research and development, manufacturing and design of large mainframes. But, for the future, even as IBM is struggling to cope with the changing industry by making alliances with small companies, I believe Amdahl must do the same. We must address those changes in the industry.

Amdahl cannot stay only in the IBM-compatible market. So I'm expecting to see some joint development synergies in software and hardware for UNIX systems. One example would be the mainframe UNIX system. Amdahl has been offering UTS on their 5090. That is a major change from their traditional MVS operating system business. Fujitsu is also offering our version of mainframe UNIX.

So we are expecting to see a lot of cooperation in the UNIX software area.

Q: *As Fujitsu focuses more on the services, you'll be required to become more involved in and knowledgeable about the business issues of your customers. That means dealing with lots of cultural and local issues. Can Fujitsu or any company be a truly global provider of IS services?*

A: Of course we have to address local customer requirements. That's why we became a partner with ICL, because they know customers in the European market much better. For some time we've shared common, basic technology with ICL—the hardware—but they've been using that common technology to develop end products that meet local customer requirements. So in providing service and support we must have a partner to meet local customer needs.

But even in the area of service and support there is some basic know-how that we can share. We are actually learning how ICL provides its customers with support and service, and that will be beneficial to Fujitsu in our business. So we believe we can achieve synergies in the support and service areas also. In a country like Australia, Fujitsu had its marketing organization and ICL had its own, both addressing local customer requirements. In such countries it's logical for us to combine our strengths....So ICL Australia and Fujitsu Australia merged last year to better address local customer needs and improve our own marketing.

Q: *You've said you give your global partners such as ICL or Amdahl as much autonomy as possible. How do you avoid duplication of effort or even competition between partners while giving them autonomy? For example, your partners ICL, Amdahl and HaL Systems Corp. all seem to be developing similar reduced instruction set computing-based multiprocessor UNIX systems.*

A: I cannot disclose the future development plans of Fujitsu, ICL, Amdahl or HaL right now. But obviously we have to eliminate duplication between those companies as much as possible. For example, Fujitsu is using servers developed by ICL and, in return, Fujitsu has developed disk drives for ICL....I don't believe that HaL is developing the same product as ICL. HaL is aiming for a higher-end, more advanced product. Our plan is to eliminate duplication between our partners.

Q: *What effect has the recession had on your push to become a more global company?*

A: It's true that, because of the short-term recession, ICL's profits have dropped. But I have to point out that they are doing better than the other IT companies in Europe. But that hasn't changed our long-term objective of [achieving] mutual synergies with ICL. Nor has it [the recession] changed our strategies in Japan. Because of the recession in Japan we have seen some short-term changes in our strategy. But our [long-term] product development directions haven't been changed by the short-term recession.

Q: *Can you give us an example of short-term strategy changes that have been brought on by the recession?*

A: We in Fujitsu, of course, are cutting down our expenses to meet these tough times. In Japan this means cutting down on fixed investment for volume production. But we haven't cut down on research and development investment. And investments in the volume production facilities will be increased again when the economy improves.

Q: *You've said you expected your ICL investment would pay for itself within 10 years. Do you still expect that to be true?*

A: In fact, my expectation is that it will happen even sooner. By pursu-

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ing synergies as much as possible and by saving on the resources we have to spend on development and so forth, I think we can generate revenues and profits and make money.

Q: *You've taken a personal interest in Fujitsu's PC business. How satisfied are you with the progress the company has made?*

A: On the positive side, the new product we announced last fall, FM Towns II, has been very successful. We are achieving 60 to 70% growth from the previous year. When we introduced FM Towns we were able to offer only 25 applications. Now that number has become 600. We have also made penetration into the education market....But, of course, I'm not totally satisfied with the current market share. But, if we can keep up the pace at which we are growing because of the software we have accumulated, I believe our market share will go up. In order to achieve that, I believe we have to cut down the prices of the new models even more. So we have to make efforts to bring down our costs.

Q: *Some observers have seen IBM's financial difficulties and its reorganization as an indication that Big Blue is no longer in a position to dominate the IT industry. Do you agree?*

A: I believe that it is natural that users are requiring a more and more multivendor environment. We have to satisfy their needs to integrate personal computers and workstations from other vendors. We have been doing that already. Concerning their organization, it's important to develop not only the product-oriented groups, but we also need a cross-functional group to address those integration needs. In my personal view, IBM's recent reorganization addresses the product category but not the cross-functional, customer-oriented organization element. So the customers may not be satisfied with the [IBM] reorganization. ■



IS Revenue **\$19.52 Billion**

ASIAN RANK 1

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A strange thing happened to Fujitsu Ltd. on its way to becoming a global information technology supplier: it was waylaid by the worldwide recession, which slowed even the largest and most successful of Japanese companies last year.

Fujitsu, Japan's leading mainframe vendor, saw many of its large systems customers—particularly those in financial and retail markets—postpone orders as they looked to cut capital spending. That led to severe price competition among Fujitsu and its mainframe competitors. And that hurt profitability.

As a result, Fujitsu's 1991 net earnings dropped by 85.2% to ¥12.21 billion (\$90.8 million).

But Fujitsu's revenues from computer and other IT products actually grew by 27.7% to ¥2.63 trillion (\$19.52 billion). Much of that increase, however, was attributable to Fujitsu's 80% share of ICL PLC, which the Japanese vendor acquired in 1990. Fujitsu's share of ICL's revenues, which were included in the company's full-year consolidated results for the first time in 1991, boosted Fujitsu's overseas revenues by 39.1% to nearly 30% of total revenues. The ICL acquisition, however, didn't boost profitability, as the London systems company's own earnings were down 41%.

In 1991, Fujitsu followed its ICL acquisition with several more international initiatives. Fujitsu, through ICL, acquired Nokia's data systems group, further strengthening Fujitsu's distribution channels in Western Europe and contributing to a 15.6% jump in ICL's revenues. Fujitsu also acquired its hand-held PC partner Poqet Computer

Corp. and invested more than \$40 million in UNIX system startup HaL Computer Systems Inc. Concurrently, Fujitsu announced its intentions to try again to market its supercomputers in the United States.

Michio Naruto, Fujitsu's senior vice president and a key architect of the company's globalization strategy, says the company would have liked to make more international acquisitions in 1991, but the recession got in the way.

At home, Fujitsu responded to the recession by cutting its own capital spending by one-third to ¥140 billion (\$1.04 billion) in 1991. The company even reduced the pay of some of its top executives, a largely symbolic act. Fujitsu decided not to cut research and development spending, however.

The company's disappointing results last year weren't caused only by poor economic conditions. Fujitsu executives acknowledge that, like their U.S. and European cousins before them, Japanese IS executives seeking lower costs are beginning to consider downsizing from mainframes to UNIX-based systems and client/server architectures.

Fujitsu responded to that trend in 1991 by introducing the DS/90, a UNIX system based on reduced instruction set computing. The company also unveiled a plan called Message 90's for tightly integrating its M-Series mainframe products into multivendor networks.

Overall, Fujitsu says it expects its open-systems product revenues to grow by 31% per year between now and 1995, compared to 10% annual growth for proprietary systems.

Fujitsu also continued its push into PCs in 1991, introducing a new release of its multimedia FM Towns system as well as a pair of portables in its FMR line. The three-year-old Towns, which had not done well previously, finally showed some life in 1991, with revenues growing about 70% in a Japanese PC market that shrank overall.

Still, Fujitsu's gains in the domestic PC market are coming painfully slowly. The company's market share continues

to hover in the 13 to 14% range compared to about 50% for the market share leader, NEC Corp. The problem: Fujitsu admits that large corporations still have not bought into Towns in a big way. In fact, 90% of Towns shipments are to schools or individuals, the company says.

In the near future, Fujitsu will continue its push toward open systems, PCs, service business and global markets. Revenues from high-end mainframes, which continue to be the company's bread and butter, grew about 10% in 1990, estimates IDC Japan. That was thanks largely to the M-1800, Fujitsu's largest mainframe, which started shipping last year.

But that mainframe growth fell far short of Fujitsu's expectations. And, longer term, Fujitsu expects mainframe sales growth in Japan to slow from low double digits to between 5.5 and 7.5% annually. If an improving economy in 1992 permits those growth rates and an easing of pricing pressures, Fujitsu says it expects an 8.9% increase in revenues this year and a 22.7% improvement in net income.

Many experts, however, believe that little if any economic recovery will come to Japan this year and that the mainframe growth rate will be at the lower end of Fujitsu's expected range.

"If that happens, Fujitsu could be very vulnerable this year," predicts Barry Dargan, head of research for securities firm James Capel Pacific Ltd. in Tokyo.—Jeff Moad

IS Revenue **RANK** **\$16.17 Billion**

2

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When it came to sales of IS products, NEC Corp. wound up 1991 smelling like a rose compared with

other Asian IS vendors. While admitting that second-half computer sales were far below original expectations, NEC officials express a confidence not heard at other companies. An unexpected gain in the company's personal-computer market share and the growing strength of its mainframe business bolstered the executives' optimistic outlook.

However, a healthy 12% growth in IS revenues to ¥2.18 trillion (\$16.17 billion) contrasted grimly with total corporate sales, which increased just 2% during the fiscal year to ¥3.77 trillion (\$28.10 billion). Net income suffered, plunging 72% to ¥15.2 billion (\$113.0 million), reflecting 1991's weak market for semiconductors as well as the general economic downturn in the final half of the fiscal year, which ended in March 1992.

Boosting NEC's IS revenues was an improvement in market shares almost across the board. A survey of Japanese markets conducted by the *Nikkei Economic Newspaper* indicates that NEC's share expanded 2.1% in the personal computer market to 53.1% and 1.8% in the office computer market to 27.3%. The same survey also shows a 0.4% rise to 17.3% in NEC's share of the total value of domestic installed mainframe computer products.

Revenues for NEC's computer division grew 8.1% last year to ¥1.57 trillion (\$11.67 billion), with an 11% rise in domestic deliveries to ¥1.45 trillion (\$10.78 billion) but a 21.3% decline in exports to ¥118 billion (\$877.3 million). Officials expect slower growth this year as the company feels the full impact of the recession, and they project that computer division revenues will increase only 4.4% to ¥1.64 trillion (\$12.19 billion) for fiscal 1992. NEC IS revenues also include sales of factory automation and other industrial computer systems by NEC's industrial systems division and sales of mobile faxes, G4 faxes and home banking terminals by the communica-

tions terminal division.

A 26% increase in mainframe revenues contributed substantially to the growth in NEC's total computer sales. This revenue growth derived from pent-up demand for the largest mainframes—particularly the new eight-processor ACOS 3900, introduced in October.

NEC sources say revenues from the ACOS 3900/3800/3600, its largest mainframes, were up 20%. Sales of ACOS 3300 and ACOS 3400 mainframes were flat, however, because of competition with office computers and UNIX machines. Revenue growth wasn't indicative of unit sales, which fell: Very large system shipments dropped 3% to 159 units; large system sales declined 21% to 212 units and medium-size and small systems tumbled 17% to 1,035 units. Reflecting economic conditions, NEC expects only a 5% increase in mainframe revenues for the current fiscal year, says Hiroo Shin, product planning assistant general manager.

NEC's personal computer business remained strong last year. Despite a double-digit plunge in the Japanese personal computer market, NEC increased personal computer deliveries by 2% to 1.35 million units, selling 1.31 million units for domestic use and 40,000 units headed abroad.

Maintaining growth in this market is vital, since PC sales account for 35% of NEC's total computer revenues. NEC is often the "safe buy" for Japanese MIS executives. NEC associate senior vice president Yoshi Takayama attributes the company's strength in PCs to user trust in NEC's stability and technological edge. "When the economy is tight, customers purchase products with proven reliability," he says.

NEC brought some innovative products to market last year, including a new color notebook, the 98 Note Color, which is well priced at under \$4,500; the company is selling 5,000 units per month. And its existing EWS4800 workstation series was given a boost by a 6,000-unit order from

Daiwa Securities Co. Ltd. for an on-line business and information system.

But NEC's PC business, although the overwhelming market leader, faces future struggles. When asked about the threat of IBM's DOS/V open architecture, which processes both English and Japanese software, and the onslaught of low-priced IBM compatibles from Korea and Taiwan, Takayama counters that "NEC's PC-9800 series is designed for Japanese-language application users who constitute almost 95% of the Japanese market, while DOS/V products are aimed at a small international segment of the market." Yet the DOS/V challenge cannot be ignored, asserts a survey conducted by the Japan Personal Computer Software Technology Research Center, which forecasts a 14% market share for DOS/V personal computers in 1993.

Facing an increasingly tough domestic market, NEC is increasing its international reach. Control Data Corp., now Control Data Systems Inc., agreed in January 1992 to resell NEC's 25.6GFLOPS, SX-3R supercomputer series. The firms hope that Control Data can sell 20 systems over the next four years. That would be 25% of the 80 supercomputers NEC hopes to deliver—50 to Japan and 30 worldwide—by 1996.

—John Rossman



IS Revenue **\$11.17 Billion**

HITACHI LTD.

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Chiyoda-Ku, Tokyo 101, Japan
(81-3)-3258-1111

The Japanese economic downturn that started in late 1991 took a heavy toll on Hitachi Ltd.'s results for last year and threatens to have an

even larger impact in the current fiscal year. Consolidated corporate revenues remained flat at ¥7.77 trillion (\$57.74 billion), and net income dropped 45% to ¥128 billion (\$951.7 million).

In addition to suffering big losses in the semiconductor business as prices plummeted for 4-megabyte dynamic random access memory (DRAM) chips, Hitachi was hurt by major cutbacks in computer system investments on the part of the financial industry, which analysts say accounts for 35% of Hitachi's computer revenues. And although computer revenues increased 5.6%, Hitachi expects they will fall 3.8% in the current fiscal year. "This is our most serious crisis since entering the computer business," says a top company official, who requested anonymity.

The crisis is so serious that top executives are taking pay cuts this year ranging from 10 to 15%. Hitachi has moved 2,000 of 5,000 temporarily idle workers, largely in the semiconductor and AV divisions, to more profitable parts of the company. And it has taken the drastic step of sending 60 semiconductor division employees to an unrelated company, Hino Motors Ltd., a Toyota Motor Corp. subsidiary, where they will work on the Corolla II assembly lines.

Hitachi estimates IS revenues for the 1991 fiscal year at ¥1.50 trillion (\$11.17 billion), an 8% increase from the previous year. While Hitachi does not break out the profitability of IS products, it expects that the earnings contribution from its Information Systems and Electronics Division, which includes both IS products and semiconductors, will continue to decline this year as a portion of corporate operating income.

In response to its poor performance, Hitachi will attempt to grow its relatively small midrange and personal computer businesses, which together accounted in 1991 for only 20.6% of its computer revenues—in contrast to its M-Series mainframe and software, which accounted for 50% of computer

revenues, analysts say.

Sales of UNIX workstations, some of which Hitachi is building with reduced instruction set computing chips from development partner Hewlett-Packard Co., increased 5% last year. The company is said to be planning a 100-MIPS HP-PA laptop.

Hitachi's partnership with IBM Japan is heating up as well. The two companies are jointly developing personal computer and multimedia products. Hitachi intends to market the Flora 3010N notebook made by IBM Japan, along with the rest of Hitachi's Flora PC series, through 2,000 of Hitachi's 9,000 consumer goods chain stores.

At the high end of its lineup, Hitachi introduced the new HITAC S-3000 supercomputer series, which achieves a maximum speed of 32GFLOPS. It expects to sell more than 100 systems over the next five years, garnering 30% of the domestic market. But Hitachi will have to work hard to achieve this goal—10 percentage points more than its current market share—since more than 30% of sales thus far have been to Hitachi group companies.

Hitachi also filled out its new M-800 mainframe series. In the process, the company cut its low-end mainframe product list from three families to one in preparation for the growing competition from office computers and workstations. Sources say mainframe revenues increased about 10% last fiscal year, even through orders fell 10% to 544 units for very large systems, 34% to 243 units for large systems and 16% to 977 units for medium and small systems.

Product introductions alone may not be enough to bolster the company's sinking fortunes. As Shozo Shigeoka, editor-in-chief of *Nikkei Computer*, says, "Orders for general-purpose computers were down considerably in the first half of 1992. If this situation continues for long, Hitachi will have to implement a serious restructuring of its computer business and investments."—Tim Smith

THE DATAMATION 100

ASIAN 25



IS Revenue **\$5.00 Billion**

ASIA

4

TOSHIBA CORP.
Toshiba Building
1-1-1 Shibaura, Minato-Ku
Tokyo 105-01, Japan
(81-3)-3457-2930

Toshiba Corp. took a square hit to its semiconductor and personal computer businesses last year, and its financial results tell the tale. While total corporate revenue inched up to ¥4.72 trillion (\$35.11 billion) in the year ending March 31, 1992, net income plummeted 67% to ¥39.5 billion (\$293.6 million). IS revenue dropped 8.2% to an estimated ¥672.0 billion (\$5.00 billion), practically wiping out the previous year's 9.6% gain.

The culprit was PCs. Accounting for half of Toshiba's total IS revenues, PC sales plunged 23.6% to ¥275.0 billion (\$2.04 billion). Sales of peripherals, too, were down, dropping 8.6% to ¥96.0 billion (\$714 million).

Other areas of Toshiba's IS operations did considerably better, however. Sales of midrange systems rose 7.4% to ¥175.0 billion (\$1.30 billion), and workstations surged 34.2% to ¥42.0 billion (\$312.3 million). Unfortunately, workstations make up only 6.3% of Toshiba's total IS revenue, whereas PCs account for more than 40%.

Much of the damage in the PC arena occurred in the United States, where, in the face of a slow market racked with price wars, Toshiba reports its market share slipped from 20 to 14.3%. Although the company is not interested in initiating such wars, says Steven Lair, vice president of marketing at Toshiba America Information Systems Inc.'s Computer Systems Division, it is willing to meet price reductions "to demonstrate our long-term commitment to the market and our customers." Accordingly, Toshiba cut prices 16 to 24% in the first quarter of 1992. In contrast, in Japan, Toshiba's PC sales increased 2%.

In the face of tough times, the company has kept the level of its spending on

research and development constant at ¥300 billion (\$2.23 billion). Toshiba hopes that new products such as the T4400SXC, one of the first 486SX TFT-LCD active matrix color notebook computers, will generate sales, but does not expect any revenue growth in this area for fiscal 1992. Testuya Mizoguchi, general manager of Toshiba's personal computer and workstation division, stresses that "products that create new markets" are necessary to maintain growth.

Ties were strengthened with Sun Microsystems Inc. during the year as Toshiba announced plans to use the Solaris 2.0 operating system in both its SPARC LT laptop workstation series and 3100 personal computer series. Toshiba sold a total of 7,700 workstations (4,800 desktop units and 2,900 laptop units) for the year and expects this figure to reach 9,000 units (5,400 desktop and 3,600 laptop).

At the end of 1991, Toshiba teamed up with Sequoia Systems Inc. to jointly develop a UNIX, fault-tolerant, on-line transaction processing server based on Scalable Processor Architecture (SPARC) technology. The two companies hope to have a product ready by 1994 that achieves maximum speeds of 2.4 trillion instructions per second. Toshiba is billing this UNIX server as the centerpiece for the company's open network computer system strategy and will gradually revise the proprietary operating system of its midrange computers so that it is compatible with UNIX.—Larry Greenberg



IS Revenue **\$4.77 Billion**

ASIA

5

MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.
1006 Kadoma, Kadoma City,
Osaka 571, Japan
(81-6)-908-1121

Japan's electronics and computer firms are smarting from diminishing

profits and intensely competitive markets at home and abroad, and Matsushita Electric Industrial Co. Ltd. is no exception. In the fiscal year through March 1992, consolidated net income fell 48.7% to ¥132.9 billion (\$988.1 million), despite a 13% rise in revenues to ¥7.45 trillion (\$55.39 billion). DATAMATION estimates that Matsushita's IS revenues increased 8%, to ¥641.5 billion (\$4.77 billion).

However, the information systems sector continues to be a glaring weak point in the lineup of the giant electronics firm, which decided in 1964 to abandon its mainframe business and not pursue the IS market.

Trying to get back into the game, Matsushita forged ties with Sequent Computer Systems Inc. Munich-based Siemens Nixdorf Informationssysteme AG, Sun Microsystems Inc. and Tandy Corp. over the past few years. Matsushita also holds a majority share of workstation maker Solbourne Computer Inc. of Longmont, Colo. All this theoretically gives the company access to a wide range of computer hardware and technology, but the links have failed to help Matsushita make major inroads into computer markets either at home or abroad. "Nothing has worked yet," says Darrel Whitten, securities analyst at Prudential Bache Securities (Japan).

Consider the sad history of Matsushita's control of Solbourne. Matsushita poured close to \$100 million into Solbourne, but the company stumbled last year due to poor management decisions exacerbated by conflicting goals and tensions between Solbourne and Matsushita, according to *Electronic Business* magazine. After failing to get a competitive workstation to market in time, Solbourne announced early this year that it would instead concentrate on network servers.

In June 1991, Matsushita started selling its own laptop workstation based on Sun's Scalable Processor Architecture, the P2100, which features a 15-inch color liquid-crystal display. The ¥3.85 million (\$28,625) price

tag will preclude large sales volumes—Matsushita forecasts sales of 3,000 units in two years, saying it is a high-end machine for those who truly need a color screen in a tight space. The company intends to market the machines overseas as well through some collaboration with Solbourne that hasn't been detailed.

Despite the setbacks, Matsushita is intent on becoming a force in computers. After the company reached a technology agreement with Sun last year, Takeo Yoshikawa, manager of workstation development for Matsushita, said, "With audio-video and computer communications becoming more important today, the firm needs a strong computer division to compete in the marketplace."

Ignoring its lack of success so far from alliances, Matsushita is working on more joint ventures. It is talking to AT&T, among other firms, about joint development of a pen-based portable computer.—Dennis Normile



IS Revenue **\$4.37 Billion**

CANON INC.
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Shinjuku-Ku, Tokyo 163, Japan
(81-3)-3348-2121

Sales growth of 21.5% in computer peripherals and subsystems propelled Canon Inc.'s IS revenues to an estimated ¥588.0 billion (\$4.37 billion) last year, up 14.9%. Overall revenue was up 8.2% to ¥1.87 trillion (\$13.90 billion), but net income slipped 15.1% to ¥52.16 billion (\$387.8 million), due to the strong yen and the worldwide recession.

Canon's biggest IS-related product continues to be its laser printer engine, used in its own printers as well as in those of Apple Computer Inc., Hewlett-Packard Co. and others. With

about 70% of the market, laser printer engines continued to be Canon's cash cow, but Canon says the growth in peripherals last year came from bubble jet printers. Its BJ-10 series of portable printers is piggybacking on the notebook computer surge.

In addition, last year Canon released a desktop color bubble jet printer, the BJC-800/820, which is an indication of Canon's strategy of moving toward stand-alone devices that can be connected into networks. However, there's heavy competition in color printers and Canon won't dominate that market as it does the market for laser printers, according to analyst Steven W. Myers of Jardine Fleming Securities Ltd.

Canon also is getting into computer integration services through its half-owned domestic sales arm, Canon Sales Co. Canon Sales resells computers from Apple, Cray Research Inc., IBM and Next Inc. The money-spinner here has been Apple's Macintosh. In the October-December quarter of 1991, Apple unit sales in Japan jumped 40% over the previous quarter while shipments of PCs by Japan's makers declined 29%, according to the Japan Electronic Industry Development Association; Canon Sales is Apple's biggest Japan sales agent. Despite a \$100 million investment in Next, Canon Sales has failed to make a dent in the market with its workstation.

Canon is taking a big gamble to move into another computer-related hardware niche—flat panel displays. Last fall it unveiled prototype ferroelectric liquid crystal displays (FLCDs), which may eventually prove easier to fabricate into large panels than conventional LCDs. However, manufacturing troubles led to postponing full-scale production to late 1993, a year later than planned. Canon also scaled back its earlier optimism—last year President Keizo Yamaji had boldly predicted, "The LCD market will balloon to ¥2 trillion by 2000, and we'll clinch half that market."

Canon forecasts group revenues of ¥2.05 trillion (\$15.2 billion) in 1992, up 9.7%, but no growth in operating income, predictions that analyst Myers says are realistic.—Dennis Normile



IS Revenue **\$2.94 Billion**

NTT DATA COMMUNICATIONS SYSTEMS CORP.
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You might say that in 1991 NTT Data Communications Systems Corp. was in the right place at the wrong time.

As Asia's largest vendor of systems integration and facilities management services, the wholly owned subsidiary of Nippon Telegraph and Telephone Corp. is in a good position to cash in on one of the fastest growing IT segments in Japan. Revenue from systems integration and other IT services will grow by 18.5% per year between now and 1995, estimates International Data Corp. Japan Ltd. That's almost twice as fast as hardware revenue growth in Japan during the same period.

That shift from hardware to service and support spending helped NTT Data increase its revenue in fiscal 1991 by 14.5% to ¥394.9 billion (\$2.94 billion). The increase was just shy of the 15.8% gain the company projected at the outset of 1991.

But, like many of its hardware vendor counterparts, NTT Data saw the recession in Japan take a toll on its earnings, as customers in some critical industries delayed or scaled back projects as competition intensified. NTT Data's net earnings dove 60.9% to ¥5.07 billion (\$37.7 million), falling far short of the modest 4.2% increase that management had predicted for the year. It was the company's first profit

decline since NTT Data spun out from NTT four years ago.

About half of NTT Data's total revenue comes from rentals on existing systems, such as the massive funds transfer application the company has built for 4,800 banks in Japan. That steady revenue stream tends to even out the peaks and valleys in NTT Data's sales figures.

And, says Koji Abe, executive manager at NTT Data's development headquarters in Tokyo, the company suffered from a slowdown in new orders, particularly from large customers in the federal government and financial industries.

"This was clearly the result of the stagnant economy," says Abe. "Particularly in the financial markets, customers weren't canceling orders, but they have been scaling them back or stretching them out."

NTT Data's business also suffered from what Abe says was increased competition from hardware vendors. "Because the mainframe manufacturers don't expect substantial hardware growth, they have been looking to provide [IT] services in competition with us," says Abe. "That has meant lots of competition and slim margins for us."

NTT Data doesn't expect those competitive pressures to ease anytime soon. But the company does have a strategy for boosting revenue and improving profitability. For one thing, it's attempting to reduce its dependence on large financial and government contracts by working with partners to develop packaged solutions for new areas such as manufacturing, retailing and distribution.

NTT has been making some progress in broadening its customer base. In 1991, says Abe, 23% of the company's revenue came from outside the finance and government sectors. That was up from 19% a year earlier.

NTT Data is also trying to address competitive pressures by expanding outside Japan, primarily by offering services to multinational customers

headquartered there. In addition, NTT Data paid \$2 million last year to acquire 50% of Los Angeles-based software services company MISI International to bolster its operations in Southern California. It also opened a new office in Hong Kong, primarily to support customers moving into the People's Republic of China.

NTT Data also is trying to grow by moving into new businesses such as consulting. Last April, it established its NTT Data International Management Consulting subsidiary.

Even if the Japanese economy turns around this year, NTT Data officials don't expect competitive pressures to ease. The company projects revenue will grow a modest 9.4% to ¥432 billion (\$3.21 billion) this year, but expects a recovery in net earnings to ¥8.0 billion (\$59.48 million). —Jeff Moad



Ricoh Co. Ltd.'s IS revenue inched up 1.5% to ¥342.8 billion (\$2.55 billion) in the fiscal year ending in March 1992, far off the 31% pace set in the preceding year. The company blames the recession for limiting domestic sales gains to 7.1% and for the 10.9% decline in overseas sales. Overall revenue was up 1.4% to ¥1.02 billion (\$7.56 billion), while earnings fell 84.9% to ¥2 billion (\$15.2 million).

Though not considered a power in computers, Ricoh claims that computer sales are actually the largest single component of its IS revenue. It sells its own desktop and notebook computers in Japan and assembles PS/55 notebooks for IBM Japan. Copiers, fax machines and other office

equipment provide the rest of Ricoh's sales.

The heart of its IS push is in digital imaging technology. "Digital, color and plain paper image-processing peripherals will be the key factors" to the company's growth in the future, a spokesman contends. One Ricoh hit last year was the IMAGIO MF530 copier, which can be equipped with facsimile, scanner and printer capabilities at the buyer's option. The company intends to start overseas sales "soon."

However, Ricoh typically lags a step behind rival Canon Inc. in new product development, according to Barry Dargan, an analyst with James Capel Pacific Ltd. Its optical filing system and laser printer were late to the market, he notes. The problem seems also to plague Rios Systems Co., a joint venture between Ricoh and IBM Japan, which introduced its first scanner last year.

Ricoh is trying to reverse its lag-gard ways. R&D spending will grow 5% to ¥58.4 billion (\$434 million), while capital spending is being slashed to bolster the company's earnings. However, officials concede that the company will suffer an operating loss this year. "Ricoh doesn't seem to have the products moving through the pipeline to restart growth," notes analyst Dargan. —Dennis Normile



Nihon Unisys Ltd.'s share of Japan's mainframe market declined by 0.2 percentage points to 10.1% last year, but revenue increased 4.8% to ¥340 billion (\$2.53 billion) in the year through March 1992 as the overall mainframe

market grew. Net profit totaled ¥3.27 billion (\$24.3 million), jumping 62% after an extraordinary tax payment the previous year cut earnings. The 6.4% drop in operating income to ¥8.1 billion (\$60.2 million) gives a clearer picture of the competitive pressures the firm faces.

Mainframes imported from the U.S. parent, Unisys Corp., account for over 50% of sales. Two new mainframe series were announced and shipped last year—the 2200/900 and the A19. However, the company's long-term prospects aren't in mainframes but in the client/server architecture, software and services.

This year, Nihon Unisys shifted 200 people from mainframe sales to a new department to concentrate on selling UNIX workstations from Sun Microsystems Inc. and Toshiba Corp. and a server from its U.S. parent. It also set up a wholly owned subsidiary, O.S. Engineering Ltd., to focus on sales of UNIX networks bundled with software tailored for specific users.

Nihon Unisys is moving to expand its software businesses—services and software accounts for 37% of revenue, up from 24% in 1990. One particular strength is in computer-aided design software for use on workstations. Last year, Nihon Unisys announced a CAD software/hardware package called Cadcons, based on a joint venture with Toyota Motor Corp. It also announced a banking software package called Triton, aimed at smaller regional banks.

Despite the shift in focus, Japanese IS managers share a lot of uncertainty over the company's future. Unisys dropped previous plans to sell its 32% share in Nihon Unisys, but there are concerns over the health of the parent company. "If Unisys stops making computers," notes a spokesperson, "we won't have much to sell."

Analysts say the company may have some breathing space to develop workstations and servers, because the downsizing trend in Japan is lagging the transition in the United States.

—Dennis Normile

IS Revenue **10** ASIA \$2.39 Billion

OKI ELECTRIC INDUSTRY CO. LTD.
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(81-3)-3501-3111

"Last year was awful," says Touru Mori, Oki Electric Industry Co. Ltd.'s general manager of information systems planning: a net loss of ¥488 million (\$3.6 million) in the year through March 1992, down from a profit of ¥9.87 billion (\$68.1 million) the year before. Total corporate revenue inched up 3.1% to ¥681.3 billion (\$5.07 billion). Oki says IS revenue was ¥321.2 billion (\$2.39 billion), up 3.7%, and includes sales of printers, data communications gear, automated teller machines, workstations and systems integration services.

Japan's economic slowdown is hitting all IS companies, but Oki's dependence on sales to the beleaguered financial sector is making the pinch particularly painful. Sales of ATMs and on-line transaction processing systems to banks and stock brokerages accounted for around one-third of sales last year, down from 40% in 1990. That shrinkage, Mori says, reflects capital spending cuts by Japan's troubled financial institutions.

One bright spot is printers. Sales were up 13%, due to the strength of new light-emitting diode printers released in both Japan and the United States. Masayuki Makino, a manager in Oki's information communications products group, claims that Oki has gained a point or two of market share in the all-important U.S. printer market.

Another potential Oki strength is high-performance workstations. Oki introduced an engineering workstation to the Japanese market last year and may unveil a workstation based on Hewlett-Packard Co.'s PA-RISC computer architecture this year. Last spring

Oki also reached an agreement with HP to develop client/server technology.

New products won't offset Oki's losses, though. Its earnings recovery may have to wait until 1993, when the banking industry is expected to recover. In addition, Kidder, Peabody & Co. Inc. analyst Peter Wolff says Oki is too thinly spread over markets and technologies in which it holds a tenuous position. Its strengths in telecommunications equipment and a few other bright spots aren't enough to sustain a company of Oki's size, he says. "It really needs to be restructured." —Dennis Normile

IS Revenue **11** ASIA \$2.18 Billion

MITSUBISHI ELECTRIC CORP.
2-3 Marunouchi 2-chome
Chiyoda-Ku, Tokyo 100, Japan
(81-3) 3218-3285

Mitsubishi Electric Corp. is shedding its large-system tradition to tap into the slowly growing Japanese demand for client/server computing.

Domestic barriers to such computing have been high—both language and a lack of PC standards have stood in the way. But Mitsubishi appears to be overcoming these hurdles. In 1991, computer systems revenue grew 10.6% to ¥293 billion (\$2.18 billion), in part, analysts say, due to sales of client/server systems.

Last year was the first in which the trend toward downsizing became truly evident in Japan, says Ahira Suzuki, general manager in the strategic planning department of the Information & Communication Systems Group. Suzuki believes that in the future mainframes will be used primarily as large database servers. "So we decided we should move [our] development investments away from mainframes," he says.

The company has done so in several ways. Rather than continuing to man-

ufacture its own systems, Mitsubishi in October became the first company to resell IBM's ES/9000 9121 mainframe, initially running its own proprietary GOS/EA operating system. With the economy slowing, the pace of large-systems sales is dragging, however, and the company has already scaled back its projection that it would sell 120 9121s in three years. It now expects to sell only 90.

The company has also invested in PC and UNIX systems technology from a variety of vendors. In April, it introduced a 486-based server manufactured by Apricot Computers Ltd., the U.K. PC maker Mitsubishi acquired in 1990. It's also reselling smaller Apricot PCs. In May, Mitsubishi signed an agreement to resell Apple Computer Inc. Macintoshes to Japanese corporate users; it projects sales of Apple products will grow to ¥30 billion by fiscal 1994, which ends in March 1995. The two companies are said to be jointly developing multimedia systems.

Mitsubishi resells under its own label reduced instruction set computing (RISC) workstations from Hewlett-Packard Co., along with HP's series 9000 UNIX multiuser systems. The company is said to be looking for a larger UNIX system to augment its midrange UNIX line. According to Suzuki, Mitsubishi would like to use these systems to expand business from its existing manufacturing/industrial base into finance, banking and retail markets. It's planning to work with independent software vendors to develop UNIX-based software for these domestic markets. The company will market the software through a new systems integration unit, called Mitsubishi Information and Communications Systems Engineering Center.

On its own, Mitsubishi is developing a laptop PC, and although it owns only a 3% share of the Japanese PC market, claims it has 10% of the domestic laptop market.

Thanks to the recession, Mitsubishi expects FY 1992 IS revenue growth to slump 1.4% to ¥289 billion. Although company officials project domestic sales will grow 2.2%, they say exports, which make up nearly 23% of IS revenues, will plunge 13.6%.

The recession, and particularly a slowdown in audiovisual and semiconductor sales, had already hit corporate revenue, which grew only a slight 0.9% to ¥2.61 trillion (\$19.41 billion) in 1991. As a result of heavy investments intended to bolster its sales network, net earnings slid 48.3% to ¥29.5 billion (\$219.3 million). Next year's revenue and income will be essentially flat, the company projects, with total revenue growing 0.3% to ¥2.612 trillion and net income declining 1.8% to ¥29.0 billion.—*Elaine L. Appleton, with Jeff Moad in San Francisco and John Rossman in Tokyo*



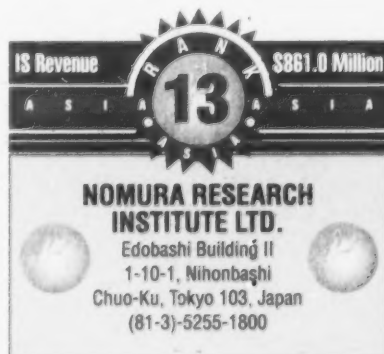
Faced with a slow market worldwide for computers and peripherals, Seiko Epson Corp.'s IS revenues increased only 0.9% in the fiscal year ending March 1992 to ¥211.5 billion (\$1.57 billion). Total corporate revenues also grew at the same snail's pace, rising to ¥470.0 billion (\$3.49 billion) for fiscal 1991; net income fell 20% to ¥4.0 billion (\$29.7 million). Seiko Epson's management responded by shifting its marketing approach and dramatically cutting expenses, which analysts say will help the company maintain 3 to 4% revenue growth and modest earnings gains.

Sales of printers, Seiko Epson's mainstay IS business, were flat last year at about 55% of IS revenues,

according to a company official. About 40% of revenue last year was from personal computers, and Seiko Epson management shifted the company's strategy out of the low-end commodity market and into higher-end products.

For example, the color laptop that Seiko Epson introduced in fiscal 1990 was followed by a notebook version, the PC-386 Book LC. In the desktop market, Seiko Epson introduced the PC-486GR based on Intel's 486 processor, which has a 1,220x750 pixel high-resolution mode as a standard feature and a modular design for CPU upgrading.

Seiko Epson also broadened the company's marketing approach. It recently concluded a venture with Digital Equipment Corp. Japan to jointly market in Japan network systems that connect the companies' personal computers to the DECpc 400 server series. The move toward direct sales of entire systems to corporate users is a major change from Seiko Epson's traditional strategy of selling to individuals through discount stores. Seiko Epson's president, Hideaki Yasukawa explains that "this venture will accelerate the joint development of products that benefit from both companies' strengths and enable us to establish a sound PC-integration business."—*Larry Greenberg*



With nearly 70% of its business from the financial services industry, the remarkable growth of Nomura Research Institute Ltd. halted last

year due to the plunge in Japan's financial markets. DATAMATION estimates NRI's IS revenue fell 4.0% to ¥115.8 billion (\$861.0 million). Overall revenue decreased 3.6% to ¥134.6 billion (\$1.00 billion). Company officials would not comment on net earnings for fiscal 1991, but did indicate that operating income declined 11.2% to ¥12.4 billion (\$92.2 million). In earlier years, NRI had posted annual revenue gains in excess of 25%, as its systems integration and software development services were increasingly in demand by its parent, the securities trading giant Nomura Securities Co. Ltd., as well as other firms.

In response, NRI curtailed its dramatic overseas growth and major capital spending projects, though it did enlarge the Osaka computer center. The difficult business environment forced NRI to develop a more diversified base of customers, particularly in the distribution area, which accounts for 20% of revenues—7-Eleven Japan is a customer.

Also, NRI converted to a more active, proposal-oriented sales strategy, focusing on approaching customers with cost-saving solutions to help them overcome the effects of the recession. NRI expects demand for these services to compensate for the declines in new systems spending, according to Planning Department manager Shunichi Miyoshi.

The System Products Division, established in early 1992, will head NRI's move into the applications downsizing market. This group already offers a database product for handwritten forms that runs on UNIX workstations and will introduce industry-specific, multivendor platform systems for securities and distribution customers before year's end. NRI expects that in-house expertise and user knowledge will give it a competitive edge in developing multivendor systems. For example, in mid-1991, NRI completed the NRI WorkBench system, which links more than 2,000

UNIX workstations and personal computers from a wide range of vendors in a single open system.

—June Houtoua



Samsung Electronics Co. (SEC) is the bluest of Korea's blue chips—the nation's largest integrated electronics manufacturer and a world force in color monitor production. SEC'S total corporate revenue in 1991 reached W5.23 trillion (\$7.13 billion), up 16% over 1990. But like most other Korean PC makers, the company's computer division is apparently sinking deeper in the red.

Sean Goldrick, head of research at James Capel Pacific Ltd.'s Seoul branch, believes only SEC's semiconductor division is turning a profit. The company's other three divisions—consumer electronics, telecommunications and computers—continue to suffer. Together, the four divisions reported a combined operating income of W664.8 billion (\$906.7 million) in 1991, up 56%. But due in part to a large debt burden and current high interest rates in Korea, net profit dipped 5% to W68.98 billion (\$94.1 million)—about 1.5% of revenue. DATAMATION estimates 1991 IS revenue at W612.8 billion (\$835.7 million), up 8.2% from the previous year.

The computer division's profitability "is a very delicate question," concedes Park Joon-Ho, assistant manager for the division's export business department. "With the price competition on international markets, every company is suffering," he says.

Last year, SEC tried to garner additional U.S. market share with its low-cost 80286 Sensor PC. But the attempt

failed and alienated some distributors who were cut out by SEC's direct sales strategy for the new PC. Unsold inventories were dumped on the domestic market, contributing to a rapid decline in traditionally high margins at home. As a result, SEC made substantial staff cuts in its PC business.

Another result was a strategic flip-flop in 1992: "We're now focusing on more profit-oriented exports," says Park. With a healthy 8.5% of revenues spent on R&D, SEC is able to produce higher margin products such as a new 486SX desktop PC using "chip-up technology" that, says Park, "lets users interchange CPUs from 33MHz to 60MHz." Earlier this year, the company signed a \$20 million contract to manufacture a new pen-based PC for U.S. vendor Grid Systems Corp.

Attempts to make headway in the workstation market have proved frustrating. SEC, which has manufacturing rights for Hewlett-Packard Co.'s HP-PA reduced instruction set computing chip set, has spent more than a year trying to develop a so-called entry-level 40MIPS RISC workstation that could sell for under \$10,000. After the delay in product introduction, however, such a price would no longer be competitive. Goldrick attributes the delay in part to SEC's lack of experience in designing and building high-performance systems.

Goldrick says heavy investment in new semiconductor facilities helped pile up additional debt in 1991, eroding cash flow and forcing the company to seek additional debt to finance new business. But SEC is now the world's leading maker of dynamic random access memory, and for all the capital the division soaks up, it also pays off with profits. This strength has helped SEC forge useful relationships. Richard Warmington, HP's representative director at Samsung Hewlett-Packard, which sells HP computers in Korea, says SEC's strength in semiconductors was a major factor in HP's selection of SEC as a business and development partner. —Geoff Crane



Sony Corp. probably wouldn't mind putting on a Walkman, turning up the volume and blocking out last year. The combination of economic stagnation in the United States and Europe, a severe slump in the audiovisual market in Japan and a further appreciation of the yen against the major foreign currencies forced the consumer-electronics-giant-turned-entertainment-mogul to register a 44% operating loss to ¥166.2 billion (\$1.24 billion). And it didn't help that the Rolling Stones jumped ship to Virgin Music Ltd. in November, taking all of their recordings since 1971 with them.

Still, analysts see evidence of success for Sony's diversification strategy in its positive consolidated profits and revenue for fiscal year 1991, which ended March 1992. Total corporate revenue rose 5.7% to ¥3.82 trillion (\$28.4 billion). Net earnings, which included a ¥61.5 billion (\$457.2 million) gain on the sale of subsidiary stock, increased 2.7% to ¥120 billion (\$893.1 million) from the previous year's level.

Sony doesn't disclose detailed figures on IS revenues, the bulk of which come from workstations and storage devices. DATAMATION estimates IS revenue for fiscal year 1991 at ¥111.7 billion (\$830.5 million). Analysts at *Nikkei Computer* estimate that Sony's workstation revenue rose only a few percentage points to ¥52.5 billion (\$390.3 million) in fiscal year 1991, while unit sales rose 7.1% to 15,000, a far cry from the double-digit growth recorded in previous years.

The analysts are far more optimistic about next year, however, pointing to

an impressive lineup of new NEWS UNIX workstations, based on the 64-bit R4000 reduced instruction set computing (RISC) microprocessor from MIPS Computer Systems Inc. New boxes include the NWS-5000 desktop machine and NWS-5900 server, which Sony officials claim will run as fast as 100 million instructions per second, as well as the 37MIPS NWS-3150 laptop. Sony is also preparing a Japanese-language version of Novell Inc.'s NetWare For UNIX, which will be sold under the title NetWare For NEWS and will enable the NEWS workstations to function as a local area network server on Novell nets. Sources believe these new machines will boost sales back into the double digits in fiscal year 1992, predicting that sales could grow by as much as 27% to 19,000 units.

In the U.S. market, Sony is deepening its ties with Apple Computer Inc., which has linked the Macintosh with Sony's Palmtop. Sony drew rave reviews for manufacturing Apple's PowerBook last year and attracted attention by porting AppleTalk to the NEWS workstation, so the servers could be used in Macintosh networks. Earlier this year, Sony acquired about 5% of Apple affiliate General Magic Inc. to codevelop consumer electronic products. Sony is also working with Apple and Motorola Inc. to release multimedia PCs in 1993, and has been invited by the Apple-IBM joint venture Kaleida to jointly develop a multimedia data format.

In the fall, Sony is expected to begin selling a DOS-compatible portable player in the United States based on CD-ROM XA technology developed in conjunction with Microsoft Corp. "The player combines the benefits of CD-ROM as a computer peripheral with the freedom of a personal information device," says Mark Frankel, vice president of the Personal Information Products Division for Sony Corp. of America. Sony will use Microsoft's Viewer application as the recommended development tool for the player,

dubbed the Bookman. Meanwhile, it is hoping to phase out the ubiquitous Walkman tape player in favor of the more expensive Data Discman—a music machine that uses nonstandard 2.5-inch CDs but can be used as a mass storage device for multimedia and portable computers. The hope is, of course, that revenues generated from these initiatives will be financial music to Sony's corporate ears.

—June Hentona



America is Acer Inc.'s soft spot—in more ways than one. The Taiwanese PC maker, which has profitable divisions almost all over the globe, has wanted to make a dent in the huge American market for personal computers. But, after three years of an aggressive expansion strategy, including an unusual and expensive marketing push to create a name-brand identity in North America, Acer found its soft spot was spoiling fast.

In 1991, Acer America Corp. lost over \$20 million on revenue of \$472 million—the only Acer division to lose money. And despite steady revenue growth this year—corporate IS revenue grew 8.5% to \$814.9 million, and total corporate revenue climbed 3.8% to \$985.2 million—the parent company's earnings have been declining over the last three years. Costs associated with a furious spate of product introductions have taken their toll on the bottom line. An acquisition spree also contributed to its earnings erosion.

After Acer's years of shaky earnings, Acer America's loss was the proverbial straw that broke the

THE DATAMATION 100

ASIAN 25

camel's back, causing the company's first-ever total corporate loss of \$22.7 million. That prompted Acer America president Leonard Liu to walk out the door in April 1992. Acer founder and chairman Stan Shih took over as group president and chairman of Acer America.

The company is attempting to reverse its fortunes, in part by continuing the new-product blitz it began last year. Simultaneously, it's paring personnel in an attempt to bolster revenue per employee, which at year's end sagged at \$188,880.

Still, a number of highlights suggest that the past year may have strengthened the company. Acer fulfilled the promise of last year's research and development efforts with a batch of high-end products that included multiuser UNIX systems, based on Intel Corp.'s 80486SX chip, as well as 386 and 486SX-based PCs. Shih hopes the new high-end systems, targeted particularly at North American users, will set Acer Inc. apart from other clone makers.

Acer has spent the last two years setting up an international service and support network, which it needs in order to compete for multinational corporate customers. In fact, chairman Shih believes that it's crucial Acer become a truly global player: "Unless we take action now, the future tides will turn against Acer," he says. Acer has increased its market share by 80% in the Third World and in some parts of Europe. And it has revamped its manufacturing process; in an effort to speed deliveries, it's planning to ship parts, instead of complete systems, from Taiwan to Acer America in San Jose.

With these changes in place, Shih expects total corporate revenue to grow 11% this year to U.S. \$1.1 billion and to break even once again by year's end. But the uncertain economy has foiled more experienced companies than Shih's, and only time will tell.

—Kimberly Mantel with Carol Wei in Taipei



Tatung Co. capitalized on its strength in mass production last year. While many Taiwanese computer firms sank into the red, Tatung, which manufactures electric fans, televisions and picture tubes in addition to monitors, mice and personal computers, grew its IS revenues 12.2% to NT\$17.72 billion (\$667.3 million). Perhaps more surprising in this era of depressed earnings, Tatung's net income increased 65% to NT\$483 million (\$18.2 million).

Until last year, at least 60% of the firm's IS revenues came from IBM, which resells Tatung monitors under its own label. With an eye on IBM's slipping fortunes, however, Tatung began to reduce its dependence on Big Blue. In early 1991, the company won an order from Packard Bell Electronics Inc. for deliveries of more than 100,000 PCs per month, which Packard Bell resells under its own name. Industry sources attributed Tatung's revenue growth to the Packard Bell order, and also say such volume manufacturing allowed Tatung to reduce manufacturing costs, contributing to its extraordinary profit increase.

Behind its solid growth, however, lie some hidden problems. A powerful, centralized management team keeps an unyielding grip on production costs and has created a successful business as a supplier to original equipment manufacturers (OEMs). But, industry insiders say that same authoritarian management structure has hampered development staff and hampered marketing creativity; for example, top management monitors all expenditures greater than \$2,000. As a result,

Tatung's own products are perceived to lack innovation and, consequently, have little brand recognition. Less than 5% of its revenues come from own-brand sales.

Tatung president W.S. Lin believes that "new products and new [distribution] channels can solve most of the problems." Lin is determined to grow Tatung's name-brand business to equal its OEM sales. To do so, he believes the company can develop new products and buy American, Asian and European distribution channels to augment its own channels.

Among the products it hopes to introduce in 1993 are palmtops, pen-based systems and liquid crystal display (LCD) screens.

By importing advanced technologies and forming development partnerships, Tatung hopes to become Taiwan's leading supplier. Currently, Tatung is attempting to develop a next-generation Sun-compatible workstation. It's ready to back a 10-year development effort, says Lin. "Not every company has the resources for this," he says. —Carol Wei



CSK Corp. stands at the center of a group of more than 25 companies that provide software, network services, systems integration, database services and other information services. Although there is no official holding company for this group, CSK prepares a consolidated financial statement including the results of 21 subsidiaries. In addition, CSK owns part of 16 nonconsolidated subsidiaries and 19 affiliates, such as

SEGA Enterprises Ltd., Japan's largest manufacturer of game software and amusement machines.

Due to its varied customer base—IS revenues are derived from financial, manufacturing, processing, distribution and service sectors—CSK weathered the Japanese recession fairly well last year. DATAMATION estimates IS revenue was up 14.7% to ¥87.5 billion (\$650.9 million) in fiscal year 1991 (ending Sept. 20). Computer services revenue, which includes programming and software development, facilities management and other services, jumped 16.7% to ¥72.9 billion (\$542.3 million), while hardware revenue was flat at ¥14.6 billion (\$108.6 million). Corporate officials add that CSK's IS revenue growth was also due to its strength in the emerging market for downsizing applications and converting MIS shops to open system environments. CSK's overall consolidated sales grew more than 12.3% to ¥90.1 (\$669.6 million) and net income rose 9.4% to ¥5.2 billion (\$38.7 million).

CSK will enhance its outsourcing capabilities to take advantage of that MIS trend, but the company's priority will be on "in-source resource management and consulting"—CSK system engineers providing guidance to MIS directors, rather than outright purchase of facilities, explains Junkyo Fujieda, senior managing director of CSK.

CSK expects to be hit harder by the struggling Japanese economy in the current fiscal year, according to a corporate forecast issued earlier this year. Total revenues are expected to increase only 5%, with computer service revenues rising 11% and hardware sales dropping 14%. "The steady decline in CSK's hardware sales is the result of a conscious effort to shift that business to CSI," according to Fujieda, who is also president of Computer Systems Integration Corp. Ltd., a joint venture with IBM Japan formed in 1989 to sell IBM PCs and minicomputers.

—John Rossman

IS Revenue **19** ASIA \$504.2 Million

INTEC INC. ~
2-11 Okuda-Machi, Toyama
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Intec Inc. outshone its systems integration rivals last year by maintaining solid double-digit growth even as Japan's "bubble economy" burst. IS in the last fiscal year rose 16.3% to ¥67.8 billion (\$504.2 million). Having helped initiate the data-processing industry in Japan in the 1960s, Intec, which in 1982 became Japan's first privately owned value-added network (VAN) service provider, has long been one of Japan's leading IS businesses.

Intec's success is due to its pioneering activities as a nationwide VAN service provider—in January it became only the second company after Nippon Telegraph and Telephone Corp. to offer a domestic integrated services digital network. With revenue up 30% from 1990, Intec's enhanced telecommunication services are its fastest growing business. While they account for only 15% of annual sales, enhanced telecom services give Intec unique prestige and enable it to more successfully pursue its other three lines of business: software development, turnkey systems and data processing. "It's difficult to make telecommunications a profitable business but it's a very good sales tool," explains Ken Segawa, executive director of Lehman Brothers Japan.

About 90% of Intec's software business, which grew 16.8% to ¥26.18 billion (\$194.7 million), is in applications, ranging from games to artificial intelligence to forecasting packages. Systems integration activities include a number of ¥1 billion orders like a recently delivered accounting system for a life insurance company, as well as a rapidly growing number of smaller orders, many of which involve workstations and networking.

In April, Intec reorganized to better coordinate its four traditionally independent businesses, especially in relation to its systems integration and multimedia plans. "We are trying to integrate technology and people so that we can handle bigger projects," notes Hisatake Jimpachi, manager of Intec's Management Administration Department. The company's first multimedia products, including compact disc interactive (CDI) systems, are expected soon.

—Michael Galbraith

IS Revenue **20** ASIA \$484.8 Million

C. ITOH TECHNO-SCIENCE CO. LTD.
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Setagaya-Ku, Tokyo 154, Japan
(81-3)-3419-9000

C. Itoh Techno-Science Co. Ltd., the principal IS operation of Japan's leading trading house, C. Itoh & Co. Ltd., is best known as the leading reseller of Sun workstations—70% of the total sales at CTC are Sun-related hardware and software.

CTC weathered the general economic downturn in Japan rather well—it boosted IS revenue 8% in the fiscal year that ended March 31 to more than ¥65 billion (\$484.8 million). CTC profited from Sun Microsystems Inc.'s strengths in downsizing mainframe-based applications, networking, open systems and multimedia. CTC also resells hardware from Motorola Inc. and fault-tolerant systems from Stratus Computer Inc.; its Stratus sales posted 30% growth.

CTC sees itself as a system integrator that focuses on applications for scientific and engineering purposes. "As a trading company we can handle any make of hardware, and we have the best information-gathering network," claims a company official. Like the hardware, nearly all the applications were made by others, but CTC has developed in house

one computer-aided design application that has been a major success—more than 1,600 units have been sold since 1988. Factory automation remains the primary source of revenue for CTC—65% last year, five percentage points less than in 1990, due to faster growth in the office automation sector.

CTC's most significant development recently was the introduction in February of UNIX-based servers from Fujitsu Ltd.'s United Kingdom-based subsidiary ICL PLC. In the short term, the server is viewed as a hot product in the office automation market, according to analysts. It is also one of the reasons the company is expecting sales to rise a sharp 15% this year. —*Michael Galbraith*

IS Revenue **21** RANK \$394.1 Million

ALPS ELECTRIC CO. LTD
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(81-3)-3726-1211

Times are tough for Alps Electric Co. Ltd., and only part of the problem is the weak economy in Japan and the West. Known as a high-volume maker of floppy-disk drives and electronic components, Alps was simultaneously slammed by the worldwide recession and sharp competition.

"Many Alps products are facing severe competition from other Far East Asian companies," notes analyst Kimi Takano of Goldman, Sachs Japan. DATAMATION estimates that in the fiscal year ending March 1992 the consolidated IS-related sales of the Alps Group took a downward turn of about 4.5% to around ¥53 billion (\$394.1 million).

"There were no real bright spots in our IS-related business" during the last fiscal year, concedes a company spokesman.

Like many Japanese companies, Alps shifted its focus from increasing sales to increasing profits. "Alps is trying to

move from the single-component business to the more value-added module business," explains Takatoshi Yamamoto, an executive director at the investment banking firm Morgan Stanley Japan. Typical of its aspirations is liquid crystal display (LCD) components, though Alps is a relative latecomer. Financial analysts doubt that Alps can succeed in the high value-added end of the market, such as thin film transistor LCDs for color laptop computers. The huge investment necessary and the severity of the competition from companies such as market leaders Sharp Corp. and Toshiba Corp. present huge obstacles for Alps.

Alps is expected to have more luck revising its business model by seeking orders for modified versions of its existing products. It is introducing more computerized assembly and flexible manufacturing to shift from mass-produced orders toward smaller, more customized orders. "It is too early to judge the results of the company's restructuring," says Morgan Stanley's Yamamoto.

This year, Alps's revenue and profits are expected to decline due to the Japanese recession and intense competition, but there are brighter spots in its IS business. Orders for hard-disk drives have shown especially dramatic growth, up almost 100% over last year, according to the company. —*Michael Galbraith*

IS Revenue **22** RANK \$373.6 Million

THE MITAC GROUP
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As the Taiwanese market grows more competitive, so too does The Mitac Group. The company, which manufactures and sells personal computers, software and services in addition to semiconductors, reported total corporate revenue growth in 1991 of 22.7% to \$540 million.

But earnings fell a precipitous 91% to \$2 million, as the previously conservative group invested heavily in an unusually aggressive global expansion, both broadening distribution channels and bringing new products to market. The recession, which forced PC prices down, also gnawed away at the company's margins.

In fact, IS revenue declined 5.2% to \$373.6 million. The group's PC manufacturer, Mitac International Corp., lost \$2.9 million on revenue that grew 25% to \$235 million. The group's Mitac Inc. systems integration and service supplier made up the bulk of the group's IS revenue with \$138.6 million. In general, the need for services is growing, and Mitac Inc.'s earnings fared somewhat better. The group doesn't disclose Mitac Inc.'s earnings, however, and says only that Mitac Inc. and MSI International Corp., the group's semiconductor manufacturer, together earned a profit of \$4.9 million.

Mitac International last year established new business units that market portable computers and PC monitors. New products in both categories were responsible for the 25% sales increase, but associated research and development spending, along with investments in the new distribution channels, caused the loss. By the end of 1992, the company plans to produce 80,000 monitors a month, to be distributed through Mitac's U.S. and European branches to local distributors and dealers. It also plans to expand the current two-product portable PC line to six products, including a handheld system. "We aim at becoming a strong portable system supplier that competes against Japanese consortiums," says Mitac Group president C.S. Ho.

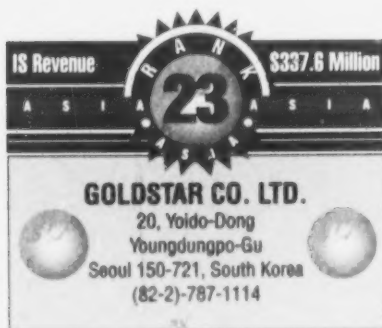
Among new distribution channels is Compac Microelectronics, a \$160 million PC distributor in Fremont, Calif., which the group acquired for \$8 million. Mitac will use Compac to develop brand-name sales in the United States. "Our emphasis [for branded products] has been Europe," says Ho. "This year, we turn toward the U.S. market." The group is negotiating more acquisitions and strategic alliances in both the States and Japan.

Despite its desire to build U.S. brand-name sales, Mitac plans a conservative marketing strategy compared with Taiwanese leader Acer Inc. "We go step by step with foot soldiers instead of overall bombing" via expensive advertisements to develop brand awareness, says Ho.

As it acquires global distribution channels, the company is also restructuring its manufacturing process. Formerly, Mitac built most systems in Taiwan but is moving toward "pipeline management"—buying components and building systems locally. In July 1992, it was expected to finish construction of an assembly line in the United States for products destined for North and Latin America. Another plant in Britain will produce products destined for Europe.

To increase European sales, Mitac this year opened Belgian, French and Spanish branches, in addition to maintaining existing branches in Britain and Germany. President Ho, who says Taiwanese companies have largely neglected the fruitful Japanese market, is currently negotiating strategic alliances with Japanese importers and chain store owners.

Ho expects Mitac's efforts to bear fruit only after a bitter battle in the year ahead, during which he expects weaker worldwide suppliers to disappear as they suffer the effects of recession. —Carol Wei



On June 1, 1992, after a very difficult year, Goldstar Co. Ltd., the electronics flagship of South Korea's giant Lucky Goldstar Group, merged with

affiliate Goldstar Electronic Devices Co., a \$111 million maker of electronics parts for computer products.

It was the latest corporate reshuffle in years of organizational changes intended to bolster Goldstar Co.'s health. During the last fiscal year, Goldstar Co.'s revenue grew 23.3% to W3.68 trillion (\$5.02 billion). But net profit plunged 44% to W19 billion (\$25.9 million), just 0.5% of revenue. IS systems and services accounted for less than a tenth of sales: DATAMATION estimates last year's IS revenue grew 21.8% to W247.5 billion (\$337.6 million). The remainder of revenue came from the company's increasingly unprofitable consumer electronics division. Opinions are divided as to whether the merger will help salvage the company that kicked off Korea's electronics industry in 1957.

"In the long term, [the merger] will be good for Goldstar," reckons Keith Nam, a Jardine Fleming Securities Ltd. analyst stationed in Seoul. About 90% of the electronics parts manufactured by Goldstar Electronic Devices go into Goldstar Co.'s personal computers, monitors, workstations and peripherals.

But another securities analyst in Seoul says the move reflects the confusion that has plagued attempts to reorganize the group's electronics business since the mid-1980s. "They still have a lot of overlapping lines," says the analyst, who asked not to be identified. "They have a lot of inventory and a lot of receivables hanging around."

Goldstar Co.'s barely floating balance sheet is buoyed by artificial profits from transactions with affiliates, according to the analyst. The analyst says Goldstar Co. forces many of its subsidiaries, most of which are operating at a loss, to supply parts below cost so the parent company can show a profit. An additional hidden drag on the company's cash flow is its 64% equity interest in debt-ridden Goldstar Electron, the semiconductor affiliate launched in 1989.

Despite its struggles, Goldstar Co. still ranks among Korea's top five PC makers in overseas as well as domestic sales. And the company is Korea's

largest distributor of Sun Microsystems Inc. workstations. But efforts to develop its own line of Sun clones have met with limited success. Part of the reason may be a lack of cash for R&D. Company spokesmen say Goldstar invested 5.8% of revenue into R&D in 1991, significantly less than archrival Samsung Electronics Co. But in June, in simultaneous efforts to reduce R&D costs and increase competitiveness overseas, the two companies signed an agreement to share—without cost—some 8,000 patents previously held separately. —Geoff Crane



As the saying goes, reports of TriGem Computer Inc.'s death have been greatly exaggerated.

TriGem Computer, South Korea's largest independent maker of PCs, workstations and peripherals, bounced back in 1991 with a 45% surge in revenue to W233.5 billion (\$318.5 million), following a 23% drop in revenue the year before.

But a \$30 million bond issue for production of the industry's first battery-powered SPARC laptop, and bank loans for a new PC factory, doubled TriGem's traditionally low debt-to-equity ratio to 207%, driving net income down 70% to a meager W2.4 billion (\$3.3 million). And extremely slow sales for a SPARC-based laptop workstation introduced last year—with much fanfare—proved a public relations nightmare for TriGem and for its U.S. development partner, RDI Computer Corp., a start-up in which TriGem holds a 10% equity stake. The combination of these three factors

started rumors flying that TriGem was on the verge of going under.

Those rumors turned out to be false. In fact, during the first quarter of 1992, a booming domestic market helped push PC revenues up another 56% and total revenue up 40% on a year-to-year basis. And the SPARC laptop, for which there is no domestic market, is beginning to show signs of life abroad, says Kim Do-Jin, TriGem's executive director of corporate planning.

Moreover, former Sun Microsystems Corp. executive Roy Wright took over the top spot at RDI in June, suggesting that a deal with Sun for SPARC laptops is in the works. Sources speculate that under such an agreement, TriGem would manufacture upgraded notebook SPARC systems for Sun, and Sun would sell them through its network of value-added-resellers.

In 1991, TriGem also invested \$850,000 in a marketing joint venture with CMS Enhancements Inc. The joint venture, CMS/TriGem Computer Corp., will sell TriGem's line of 386DX/SX and 486 PCs in the United States.

To brighten its balance sheet, TriGem spun off four unprofitable divisions into separate affiliates in January 1992. In June 1992, the company added two teams that will sell so-called "personal solutions" and "network solutions" designed to take advantage of the nascent Korean market for computer networking. "In the U.S., 90% of the PCs

are connected somehow," says Kim. "But in Korea, it's less than 10%. We want to follow that trend in network solutions as a value-added area." —*Geoff Crane*



Like many other Japanese companies, Omron Corp.'s main objective for fiscal 1991 was to maintain sales at the same level as in the previous year. And, in fact, overall corporate revenue increased a modest 4% to ¥483.25 million (\$3.59 billion), but net income plummeted 71% to ¥6.17 billion (\$45.9 million). And DATAMATION estimates IS revenue declined 4.8% to ¥40.17 billion (\$298.6 million), mainly due to reduced investment spending throughout the Japanese economy. Akio Imaizumi, director and executive general manager of Omron's Office Automation Division, projects an 18% gain in IS revenue for fiscal 1992.

One of Omron's largest sources of IS revenue last year—¥19.65 billion (\$146.1 million)—came from reselling a wide

range of equipment from NEC Corp. and Toshiba Corp. through its Omron Micom Systems Corp. subsidiary. Omron's peripherals business brought in another ¥14.32 billion (\$106.5 million), according to Imaizumi. The company also recorded ¥3.91 billion (\$29.1 million) from its Luna workstations, which are based on Motorola microprocessors.

Workstation results were disappointing last year, down 5% from the previous year's level, despite the introduction of various new models and software applications. Unofficial forecasts early in the year had predicted that workstation revenue would rise 30 to 40%. Omron plans to revive workstation sales by making better use of the Japanese distribution network of its recently acquired Nippon Data General subsidiary, by strengthening its application software platform strategy and by focusing sales efforts on factory and office automation. As a result, Omron expects workstation revenue to increase 34% in the current fiscal year. Analysts at *Nikkei Computer* are more cautious, noting that the forecast relies on a strong economic recovery. New additions to the Luna series last year include the Luna 88K Plus, which achieves top processing speeds of 147 million instructions per second running on a 33-megahertz clock, and a new operating system based on the fuzzy logic form of artificial intelligence.

—*John Rossman*

The DATAMATION Asian 25

For more information on the DATAMATION Asian 25 companies, circle the appropriate numbers on the Reader Card.

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MANAGEMENT

ECONOMIC TRENDS

Happy Days With Uncle Sam

Government workers may keep their jobs, but they'll need to stretch their IT-purchasing dollars.

Big government has started getting even bigger once again. The number of civilian government workers fell for three straight months in 1991, but beginning with August of last year, government employment slowly expanded. In April 1992, almost 18.9 million people—more than ever before—received paychecks from federal, state or local authorities.

But while personnel grew, government purchases diminished. After inflation is taken into account, government agencies bought an annualized \$930 billion worth of goods in the first quarter of this year, down 1.5% from last year. Cahners Economics expects dwindling purchases through 1994 as Uncle Sam tries to rein in its enormous debt.

The Electronic Industries Association (EIA) estimates that the federal information systems budget will see little growth, about 0.2% annually, adjusted for inflation, for fiscal year 1992 through fiscal year 1997. Employees of the Department of Defense should prepare themselves for 3% annual declines in real terms, as the agency copes with budget constraints.

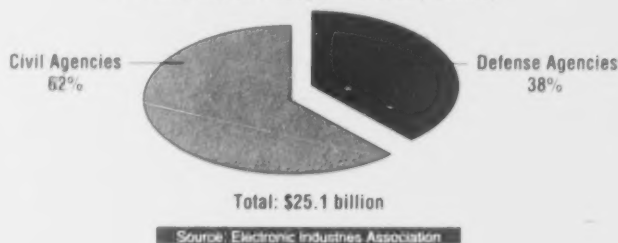
On the civilian government IT front, the EIA expects the \$15.6 billion budget to climb 2.1% annually in real terms through 1997. The heightened emphasis on law enforcement and transportation safety means that some initiatives, such as the National Crime Information Center project, valued at \$77 million, and the Department of Transportation's Intelligent Vehicle Highway System, will push forward. ■

By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services, contact Dan Buchan at (617)-630-2105.

People Up, Purchasing Down



FY 1993 Federal IT budget allocation (% share)



The Economy At A Glance

U.S. Economy: Macroeconomic And Industrial Indicators

	Actual			Forecast	
	Q4/91	Q1/92	1992	1993	1994
Gross Domestic Product	0.4	2.4	2.0	2.6	2.0
Business Investment in Equipment	-1.6	3.7	2.1	4.6	4.2
Government Spending	-5.4	3.1	-2.3	-3.7	-0.1
Consumer Spending	0.0	5.4	2.6	2.8	1.9
Exports	9.7	-0.9	5.6	7.8	6.5
Imports	2.1	-0.2	4.7	3.6	3.2

All calculations are % change in 1987 dollars; quarterly figures are seasonally adjusted annual rates

	April 1992	March 1992	% Change 4/92-3/92	April 1991	% Change 1991-1992
Manufacturing Production (1)					
Process Industries Total	109.6	109.1	0.5	103.5	6.0
Chemicals	115.2	114.6	0.5	109.0	5.7
Petroleum	109.8	109.0	0.7	105.7	-3.9
OEM Total	109.7	108.9	0.7	108.6	0.9
Computers & Peripherals	167.1	164.9	1.3	155.6	7.4
Communication Equipment	112.2	110.3	1.7	111.3	0.8
Transportation Equipment	97.9	96.5	1.5	97.2	0.7
Services Employment (2)					
Finance, Insurance, Real Estate	6,654	6,634	0.3	6,689	-0.5
Health Care	8,394	8,379	0.2	8,131	3.2
Computer & Data Processing	810	811	-0.1	788	2.8
Transportation/Utilities	5,705	5,688	0.3	5,780	-1.3
Retail Trade	18,907	18,691	1.2	19,092	-1.0
Wholesale Trade	5,968	5,949	0.3	6,066	-1.6
Government	18,899	18,882	0.1	18,707	1.0

(1) Index 1987 = 100; seasonally adjusted

(2) Millions of persons; not seasonally adjusted

Source: Commerce Dept. and Cahners Economics

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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

SEPTEMBER 15, 1992



William E. Foster,
president & CEO,
Stratus Computer Inc.,
unveils the X/AR series

Stratus Spreads RISC Bet

page 28

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DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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Stratus lowers the cost of fault tolerance with a newly powerful X AR line, now shipping. But some question its strategy in light of plans for a future generation.

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SOFTWARE'S BIG 50:

THE MAGIC IS STRONGER

*Costs skyrocketing? Marketing a shambles?
"Shazaam" say software vendors, and it's all transformed.*

It's the 1990s, and software is everything. How else to explain it?

Explain how, in the midst of one of the most crushing world economic downturns in years, sales by North America's 50 largest independent software vendors could have surged to \$15.2 billion, up almost 14% from last year's list, and over 21% compared with their own 1990 performance.

What is this magic that lets the software industry consistently transform a few billion bits and bytes, an

artfully crafted series of ones and zeros, into billions in hard gold, recession be damned?

The answer lies in that word "transform". Like medieval kings and barons, today's business leaders are on a quest for the right magical mix of elements to transform their problems into profits, to reengineer the way they do business so they can spend less and sell more. And they're turning to their corporate alchemists to make it happen.

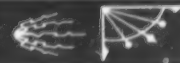
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BY MIKE RICCIUTI



THE DATAMATION SOFTWARE BIG 50



The top 50 North American independent software companies.

RANK 1991	1990	COMPANY	1991 REVENUE	1990 REVENUE	% CHANGE	1ST Q'92 REVENUE	1991 R&D	NET INCOME	1991 EMPLOYEES
1	1	Microsoft Corp.	2,275.9	1,480.0*	53.8%	680.9	290.2	581.4	10,000
2	2	Computer Associates International Inc.	1,437.8	1,310.7	9.7%	469.9	183.5	173.0	7,700
3	3	Oracle Corp.	1,085.0	1,002.0*	8.3%	290.0	141.0	76.0	7,786
4	4	Lotus Development Corp.	828.9	692.2*	19.7%	227.1	116.6	43.1	4,324
5	6	Novell Inc. ^{AA}	710.4	526.3*	35.0%	205.0	77.9	104.2	2,843
6	5	D & B Software Services Inc.	548.7	539.0*	1.8%	N/A	N/A	N/A	4,460
7	7	WordPerfect Corp. ⁺	532.5	452.4	17.7%	N/A	N/A	N/A	2,896
8	24	Borland International Inc.	501.6	418.4*	19.9%	116.8	61.0	-80.7	2,000
9	8	Mentor Graphics Corp.	400.1	435.2	-8.1%	100.1	79.5	-61.6	2,438
10	13	Ask Computer Systems Inc.	394.6	249.7	58.0%	112.1	32.9	57.6	2,233
11	18	Cadence Design Systems Inc.	353.0	322.0*	9.6%	101.4	68.0	22.0	2,300
12	10	Policy Management Systems Corp.	342.0	272.0*	25.7%	N/A	68.0	47.6	4,403
13	14	SAS Institute Inc. ⁺	295.1	240.2	22.9%	N/A	N/A	N/A	N/A
14	12	American Management Systems Inc.	285.2	261.9	8.9%	75.6	16.6	11.6	3,120
15	16	Autodesk Inc. ^A	284.9	237.9	19.8%	75.4	34.8	57.8	1,272
16	15	CompuServe Inc.	251.6	238.9	5.3%	N/A	N/A	N/A	1,625
17	26	Adobe Systems Inc. ^{AA}	229.7	168.7	36.2%	62.6	33.2	51.6	708
18	21	Sterling Software Inc.	228.9	207.0	10.6%	17.4	10.1	13.0	2,000
19	40	Symantec Corp.	210.1	124.3*	69.0%	67.4	29.3	21.5	790
20	25	Legent Corp.	207.8	180.5*	15.1%	66.0	18.8	36.2	1,150
21	22	Bolt Beranek and Newman Inc.	206.6	204.3	1.1%	N/A	32.5	6.6	2,200
22	23	Information Builders Inc. ⁺	202.3	191.0*	5.9%	N/A	30.0	N/A	1,500
23	30	Informix Software Inc.	179.8	146.1	23.1%	59.1	N/A	12.6	941
24	31	Compuware Inc. ⁺	175.0	141.8*	23.4%	N/A	N/A	N/A	1,379
25	37	BMC Software Inc.	174.0	117.0	48.7%	56.0	43.0	42.0	738
26	29	Candle Corp. ⁺	169.0	157.4	11.6%	N/A	49.8	N/A	1,000
27	32	Aldus Corp.	167.5	135.0	24.1%	44.1	23.4	23.8	952
28	33	System Software Associates Inc. ^{**}	161.9	121.0	33.8%	49.7	N/A	16.4	800
29	—	Sybase Inc.	159.4	103.1	54.6%	47.9	27.2	9.2	1,065
30	20	Cincom Systems Inc. ⁺	158.0	153.2*	3.1%	N/A	N/A	N/A	1,383
31	28	Software Publishing Corp.	141.3	153.5	-7.9%	43.4	30.7	-20.4	721
32	35	The Santa Cruz Operation Inc. ⁺	137.6	118.9	15.7%	N/A	N/A	N/A	1,196
33	—	The Continuum Co. Inc. ^{**}	128.8	97.1	32.6%	N/A	N/A	N/A	1,100
34	36	Goal Systems International Inc. ^A	128.0	108.0*	18.5%	30.9	15.2	8.2	900
35	34	Cognos Inc. ^{AA}	126.4	115.3	9.6%	32.8	15.3	4.1	1,023
36	44	KnowledgeWare Inc. ^{**}	125.3	66.2	89.3%	26.8	14.1	6.2	775
37	38	Comshare Inc.	124.1	116.0	7.0%	29.7	21.8	4.4	1,125
38	46	J.D. Edwards & Co. ⁺	123.1	72.1*	70.7%	34.6	4.5	2.6	934
39	39	Systems Center Inc.	123.0	95.0*	29.5%	31.0	20.0	4.0	939
40	42	American Software Inc.	114.0	99.1	15.0%	28.0	12.1	20.4	900
41	41	Boole & Babbage Inc.	101.0	99.1	1.9%	26.9	20.5	-10.4	640
42	46	Interleaf Inc.	94.0	84.1	11.8%	29.4	17.8	3.9	820
43	40	Attachmate Corp. ^{**} ⁺	91.0	77.2*	17.9%	22.0	N/A	N/A	594
44	—	UNIX Systems Laboratories Inc. ^{**} ⁺	77.0	70.0	10.0%	20.0	56.0	N/A	650
45	—	Central Point Software Inc. ⁺	74.8	48.7	53.6%	20.0	4.0	-1.0	319
46	—	Intersolv Inc.	70.0	70.0	0.0%	23.0	11.0	5.0	550
47	—	Banyan Systems Inc.	69.8	54.8	27.8%	21.0	13.0	3.0	633
48	—	Ross Systems Inc.	69.5	62.1	33.4%	18.0	11.0	2.0	620
49	—	Software Engineering of America Inc. ⁺	67.0	61.0	9.8%	N/A	N/A	N/A	250
50	—	Information Resources Inc.	65.8	51.4	28.0%	17.0	N/A	N/A	528
TOTAL			15,208.8	12,332.6	31.4%				91,214



THE DATAMATION SOFTWARE EUROPEAN BIG 10



RANK 1991	COMPANY	1991 REVENUE	1990 REVENUE	% CHANGE	1ST Q'92 REVENUE	1991 R&D	NET INCOME	1991 EMPLOYEES
1	Finisat SpA	1,015.6	816.7	24.4%	N/A	40.2	23.8	7,328
2	Sema Group	640.5	533.4	20.1%	N/A	24.7	18.7	6,850
3	Software AG ⁺	429.2	361.4	18.8%	N/A	107.3	N/A	4,000
4	SAP AG	426.2	308.8	38.0%	N/A	103.7	74.3	2,685
5	Logica PLC	348.9	338.9	3.0%	N/A	8.8	-1.7	3,592
6	CGI-Informatique	315.6	289.1	9.2%	N/A	10.8	29.7	3,750
7	Softlab Inc. ⁺	100.2	86.7	15.6%	28.0	25.1	N/A	860
8	Micro Focus Group PLC ^A	97.0	78.5	23.6%	N/A	N/A	4.7	546
9	Lucas Management Systems	88.0	84.0	4.8%	22.0	18.0	N/A	650
10	International Business Systems	87.2	90.6	-3.8%	N/A	7.4	0.5	1,055

All revenue figures are in \$ millions for the calendar year 1991.
* Reestimated figure ** DATAMATION estimate

^A Year ending 1/31/92 ^{AA} Year ending 11/30/91 ⁺ Privately held
Sources: DATAMATION 100, company reports

And know what? In a whole lot of cases, the Merlins of MIS are magically transforming the way their companies do business—with more than a little help from the quest masters in the software industry.

Just a sampling of the magic they've been working: used-to-be mainframe systems downsized to run as client/server; fresh and elegant GUI-based operating systems like Windows and OS/2; and new efficient, easy to use database

management systems and data access techniques.

Of course, all this new software *does* cost money. So, even though many corporate IS shops were pressured by cost-conscious managers to delay or cancel new hardware purchases in 1991, that didn't stop them from spending big on the softside. In fact, market research firm Dataquest Inc. in San Jose reports that IS investment in software finally exceeds hardware spending.

FUTURE QUEST: MICROSOFT CORP.

Never accuse Microsoft Corp. of lacking the big perspective when it comes to defining a galactic role for itself in the future. Having helped spark the Big Bang of personal computing, it was perhaps only natural for it to turn to a young physicist—Nathan Myhrvold, who studied under famed cosmologist Stephen W. Hawking—to help chart a way through its expanding software universe. That course will lead Microsoft into new dimensions of software form and function, says Myhrvold, vice president of advanced technology and business development.

Two overriding trends will shape the software envi-

and more natural way of performing business tasks. Microsoft hopes to help provide the requisite software support that will allow people "to work remotely, but with the same effectiveness that you would have in the office," Myhrvold says.

With its pervasive Windows environment, Microsoft thinks it has a vehicle that can carry it into the foreseeable future. By making Windows flexible enough to support future requirements such as 64-bit computing and symmetric multi-processing, "We've tried to create an architecture that can live over time."

While shying away from the notion of "expert" systems that completely replace people, the company also sees a coming role for artificial intelligence-based (AI) "agents or assistants."

As part of the company's move to AI, Myhrvold's developers are working on natural language processing to help simplify database queries as well as to assess the content and importance of text such as news articles and electronic mail messages. They are also working on simple inference tools that may be able to perform enough "reasoning" to handle such tasks as handwriting and speech recognition.

In pursuing these software goals and others, Myhrvold oversees Microsoft's business relationships with strategic partners. He also directs about 50 people doing advanced research, which is "projects that are challenging and risky, but which we do intend to become products." Myhrvold manages a research lab—the first ever formed by a software company, he claims. Hardware-oriented firms and universities that have done the bulk of software research up to now haven't always been able to capitalize on their work, he notes. Microsoft intends to do better.

In the research lab, unlike the advanced development group, "you try to do things that you're not sure are possible," Myhrvold explains. There would be no point to his group if it was overly conservative in its aspirations, he says. "With new technology projects, if you don't fail on some of them, you probably weren't pushing very hard."

—Dwight B. Davis



ronment in which Microsoft will operate during the next five to 10 years, Myhrvold predicts. One is the combined increase in the power of microprocessors and constant decrease in their size and cost. Within five years, 1,000-Specmark processors will be common, he says, leading to an inevitable conclusion: "The notion of computational power as something that has to be centralized is completely wrong."

The spread of powerful but small computing devices will drive the second trend, that of gigabit-per-second fiber optic networks, to every business and home. To hear him tell it, "Networking will become enormously important because we'll have zillions of these processors around," and they'll need to communicate.

Out of these two trends will come a technological synergy that will make telecommuting a much easier

"Because of the recent economic recession, management has looked at reengineering processes, putting in place new applications—new software—to save money," says Vaughan Merlyn, resident software guru at Boston-based IT consultants Ernst & Young.

New software technologies can't really convert base metal into gold—or into any other metal for that matter. But it can generate efficiencies that turn into dollars saved. Says Todd Templeton, lead systems analyst at Phelps Dodge Corp., "You can't make more copper with software, no matter how sophisticated it gets. But the software lets us process more copper with fewer people—the new applications do make us more efficient."

Templeton says the Phoenix-based copper mining and refining company is now doing more with fewer resources since it began using the entire function server line of products from Software AG to transform its IS systems into new client/server applications. The new applications tie end users on DOS, OS/2 and UNIX workstations into existing mainframe-based Adabas databases, replacing terminal-based systems previously on users' desks.

Each of the leading software vendors on Datamation's list of the Big 50 has its own special magic formula aimed at giving the vendor in question the place of honor on user's desktops at minimum, and on their LANs and mainframes as well.

Redmond, Wash.-based Microsoft was the most powerful of the software sorcerers in 1991, thanks to a whole slew of new DOS/Intel based products—the new DOS 5.0, Windows 3.1, Project For Windows, Excel 4.0 spreadsheet and Word 2.0, new development tools for Windows like C/C++ 7.0, Quick C For Windows, Visual Basic, a Multimedia Developers Kit, and the list just keeps running. Sales soared nearly 54% in 1991, making the company the first \$2 billion software vendor in history.

And others cashed in on Microsoft's magic. Cupertino, Calif.-based Symantec Corp. capitalized on Windows 3.1's modest file management features by releasing version 2.0 of the Norton Desktop For Windows, a Windows shell that includes many features of Norton Utilities. The result? Symantec's sales shot up more than 69% over 1990 to top \$210 million.

Other leading software vendors like Orem, Utah-based WordPerfect Corp., Lotus Development Corp. of Cambridge, Mass., Borland International Inc. of Scotts Valley, Calif., and even Islandia, N.Y.-based Computer Associates International Inc. all rolled out new Windows-based spreadsheet, database and word processing applications in 1991—and users quickly snatched them up,

— Mainframe systems management vendor Legent Corp. sees the future and, to paraphrase Pogo, it is us—us end users, that is. And they've set a clear course for the company to build mainframe-class support into the fast-arriving world of end-user controlled distributed computing.

The new technologies the company is building, says product development vice president Bob Yellin, will leave the datacenter out of the loop and give PC and LAN-based end users the same kinds of automated support services Legent builds for mainframe managers.

Legent is hard at work building a suite of systems software that will function as "an interface point, a very crucial interface, between the data center and the end user," says Yellin.

Some of the critical automated services Legent aims to give end users: software distribution, license management and billing/chargeback services—all of which would operate across a client/server environment with heterogeneous servers.

Legent has been touting its emerging systems management architecture, the goal of which is to build a group of service sets that can share resources and operate like a single package.

"It's all related," explains Yellin. "You have an inventory and asset management area... and you have a software distribution system which

accesses that inventory and asset database to figure out who is an existing user of something and who needs to be upgraded. And then you have the network license management server, which also needs to interact with the database in order to feed billing and chargeback operations, and to predict rates of growth of software use within the company."

But despite its push into automating distributed systems management, Yellin says Legent has no plans to abandon its bread-and-butter data center management business.

Legent was born of a merger, and has continued to grow its technology through mergers over the last three years. In fact, the company's most recent mergers show Legent laying the technological groundwork for the products Yellin pre-sages: Legent picked up software distribution and file transfer technology when it purchased New York City-based Spectrum Concepts Inc. last January, and it won output distribution technology in merging with Columbus, Ohio-based Goal Systems International Inc. in a deal that closed last summer.

Molding such products into Yellin's vision of computing's future will require rebuilding them into object-oriented, client/server versions in which both the client and the server components are portable across multiple platforms, he says. An example of just such a technology: Legent's Endeavor Workstation, a software management tool. A rewrite of mainframe-based Endeavor/mvs (which was acquired, along with Yellin, when Legent bought Business Software Technology in 1989), the workstation product includes a C language-based kernel supported by separate shells for dos, Windows and os/2 built using the object oriented C++ language.

—Ned Snell



LEGENT

FUTURE QUEST: BOOLE & BABBAGE INC.

Boole & Babbage wants to be known as the enterprise automation company of tomorrow. The vendor that introduced the first IBM mainframe performance monitor in 1967 sees a future of automated systems and network management products working across the spectrum of computing platforms.

At the heart of Boole's plan for the future is an underlying technology called Boole & Babbage Intercommunication Facility Level 3 (BBI-3). Structured on a client/server model, BBI-3 provides a common set of communications, data and user interface services for products based on MainView, Boole &

Babbage's architecture for integrating its systems performance monitors, automated operators and analysis tools.

Boole has already rolled out one new product based on the latest release of BBI-3—a performance monitor called MV Manager for MVS—and is set to release two more by the end of the year. Beyond that, Boole expects to spend the next few years adapting most of its current products to the new technology.

Olivier Thierry, Boole's director of marketing and business development, says BBI-3 was specifically designed for managing the IS environment of the coming decade—with a growing emphasis on maintaining

service levels for business applications that execute across a variety of distributed computing environments and platforms. "The end user wants service," Thierry says, "and he doesn't care whether his application is on MVS, CICS or DB2."

MV Manager for MVS is a good example of the concept in action. Whereas traditional performance monitors typically track specific system resources, MV Manager for MVS lets users track the performance of applications by creating customized views of workloads across system resources, across subsystems, even across multiple systems and processors.

For now, BBI-3 is a technology confined to the MVS mainframe world. But Thierry, says Boole, plans to work diligently to expand BBI-3's horizons.

Development, for example, of Net/Avail, a new Systems Network Architecture (SNA) network node availability product that's due for release later this year, required Boole to extend BBI-3's global data model and to build data collectors into SNA.

Also, BBI-3's DataBus will probably be extended to bring in data from Boole's Unix-based network management system, Net/Command. And Net/Command itself will be enhanced with Auto/Command, a product due to ship by the end of the year that will bring to Net/Command some of the same automation capabilities that Boole's AutoOperator provides on the host.

—Mark Taber



Boole & Babbage

boosting what might have otherwise been lackluster sales figures for some of these companies.

But that's not to say the magic is fading from the masters of the mainframe and midrange software industry. In fact, many users, faced with inefficient, expensive and complex mainframe systems decided to hold off buying more hardware and have boosted their spending on a new generation of innovative mainframe systems software tools instead—subsystem monitors, DB2 tools and change management applications—to help them boost efficiency and rein in data center costs.

Six mainframe system software vendors—BMC Software Inc. of Sugar Land Texas; Los Angeles based-Candle Corp.; Compuware Corp. of Farmington Hills, Mich.; Goal Systems International Inc. of Columbus, Ohio; Vienna, Va.-based Legent Corp.; and Systems Center Inc. of Reston, Va.—all reported double-digit revenue growth for 1991, thanks to some impressive product innovations. BMC, recognized by many industry followers to be a leading techno wizard among big iron system software vendors—posted 1991 revenues of \$174 million, a 49% jump over 1990.

Users continue to look for ways to offload corporate processing from their megabuck mainframes to less costly PCs and workstations.

But judging by the revenue numbers, users are not just offloading portions of applications from the mainframe, they're also downsizing entire database management systems. Relational database management system (RDBMS) vendors Oracle Corp. of Redwood Shores, Calif., Informix Software Inc. of Menlo Park, Calif., the Ingres division of ASK Computer Systems Inc. in Mountain View, Calif., and Sybase Inc. of Emeryville, Calif., report big jumps in sales of RDBMSs on UNIX. And Walldorf, Germany-based software vendor SAP AG is even betting the farm on UNIX by offering the next generation of its massive mainframe application and database system, called R/3, on UNIX only.

CA also took the leap into UNIX last year with its mainframe software; the firm announced its own UNIX RDBMS, CA/DB, and partnered with Hewlett Packard Co. of Palo Alto, to eventually develop all its software products for HP's UNIX platforms.

Sybase and Informix were the high flyers of the RDBMSs in 1991, reporting revenue gains of 55% and 23%, respectively. Oracle's UNIX revenue gains were tempered by a dip in mainframe RDBMS sales, to bring its annual gain to mere mortal 8%. But, overall revenue was still good enough for third place in the Big 50.

Even the Computer Aided Software Engineering (CASE) business, noted more for its technical wizardry than its sales prowess of recent years, seems to finally be building steam. CASE vendor KnowledgeWare Corp. of Atlanta, reported that

➤ FUTURE QUEST: INTERLEAF INC. ➤

For Interleaf, document preparation in the future will be a whole lot more than just plain ole' desktop publishing. Electronic preparation, yes, but also cross-platform electronic distribution and management of "documents" of all types.

And under Interleaf's schema, most of these documents will never see the white of paper. Instead, they will live and die electronically on databases of various shapes and types. Think of all those trees Interleaf is saving.

In the Interleaf view, documents are the medium for all corporate communications. Databases, on the other hand, are the medium for archiving structured data. To bring the two together, Interleaf provides a dynamic link between the document and the database or other applications. This link can be used to build complex, highly automated, integrated applications.

The Interleaf document environment spans a variety of Unix and Digital platforms, and will soon support most of the leading graphical user interfaces.

"Our goal is to support the four main graphical interfaces; Open Look, Motif, Windows NT, and the Macintosh," says Philip London, senior vice president, engineering and chief technical officer. The firm recently released a beta version of Interleaf 5 for Open Look; a Windows NT version is under development.

Interleaf 5 is the company's core publishing product for document creation and composition. The company has packed it with advanced technologies such as object-oriented (OO) capabilities. Interleaf architected its object technology to allow users to get at it directly through the user interface. "Objects don't provide value unless the user can work with the objects without programming," says London. With Interleaf, every element of the document is defined as part of a class of objects. By manipulating objects and classes, users can control every aspect of the electronic document.

The firm's other major products increase the users' power to manage and distribute electronic documents, whether they end up on paper or not. The Relational Document Manager allows users to manage the creation of complex documents through revision control, access control and workflow management capabilities. And Interleaf's innovative new WorldView product can bring a wide range of document and image types together into a single WYSIWIG view and cross reference to other documents on the system at will.

It's no surprise that Interleaf supports a document-centric view of the future. "The vast majority of corporate information takes the form of human-readable documents," says London. "Most people spend their day reading and writing memos, reports, proposals, and other documents, not retrieving data from a database."

—Alan Radding



Interleaf

revenue jumped more than 89% in 1991 to top \$125 million. And Bachman Information Systems Inc. of Burlington, Mass., although not yet a member of the Big 50, saw sales grow a whopping 80% in 1991 to \$39 million.

Larry McCoy saw the magic in Bachman's CASE tools. The vice president of joint product development at HBO & Co., an Atlanta-based systems integrator for the health care industry, began using a CASE tool set from Bachman to build core systems that can be easily modified from installation to installation.

McCoy says that despite tighter budgets this year, he went ahead and invested in the Bachman toolset because he believes HBO can reduce development time and costs using the tools to build core systems only once for all HBO's customers' platforms. Then, using the Bachman tool, McCoy targets the code to each platform, whether it be an IBM mainframe, a Digital Equipment Corp., or a Data General Corp. minicomputer.

"Bachman's CASE tools give us better quality applications, lower development costs and better documentation," says McCoy.

McCoy's comment may explain the amazing success of the software industry in general. New applications released by software vendors are of better quality than in the past, they can run on less costly and more powerful hardware than ever before, and, properly implemented, these applications are helping speed up time to market for new products and services.

Says Mike Seely, a software market analyst at Dataquest, "As users see what software can do for them, it's becoming more essential. It's not a luxury anymore, it's a necessity. And as that happens, it opens the door for more sophisticated applications to make their way into IS shops."

These include systems based on emerging technologies like object-oriented databases and applications, distributed databases, client/server and distributed computing systems, even office automation groupware.

Adds Seely, "In another five years it will be impossible to think that a business could run without these kinds of software tools."

The real trick for the software industry is to find a way to transform the new complexities of computing into the much sought after functional environments users expect to confront when they sit down at a workstation. Call it Windows, call it OS/2, call it UNIX—it all boils down to easy to use complex systems. The software industry's challenge is to keep advancing the technology while simplifying the product, says Seely. "That's why I think we will see double-digit growth for the foreseeable future in the software business," he adds. "It should be exciting."

—Research by Susan Mael

MANAGEMENT

ECONOMIC TRENDS

Banking Will Buy Again

The high volume of transactions in the finance and banking industry continue to make it a prime candidate for the adoption of information technology products. The automation of tasks over the last decade has sped up productivity. According to the U.S. Department of Labor, output per hour in the commercial banking industry rose from 97.3 in 1981 to a peak of 129.1 in 1988.

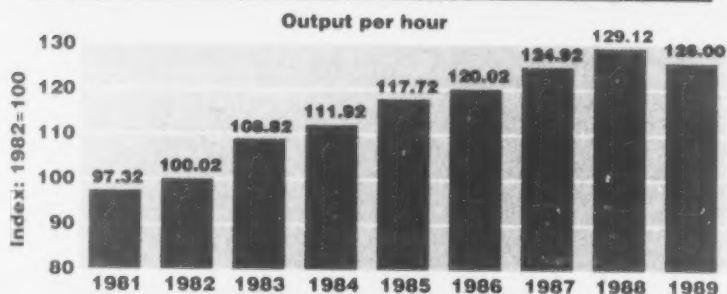
But the recent recession—and the real estate bust in particular—was anything but kind to the banking industry. Bank failures, consolidations and red ink forced delays in IT purchases last year.

Banks should be spending more on IT in the future, according to a survey of data communication managers and executives in the banking industry conducted by Williams & Associates of Salem, Mass., and Racal Corp. of New York City. Of the DP managers polled, six out of 10 believed budgets would increase by a mean of 13% this year. Nearly half of the executives anticipated a mean budget gain of 10%.

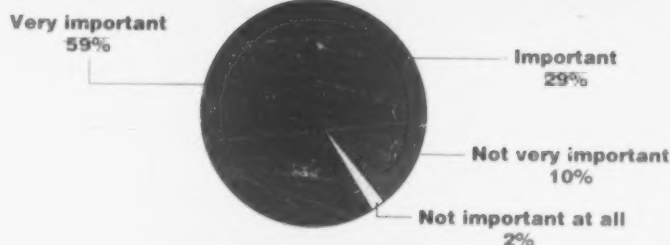
Both groups look for steady average annual increases of 10 to 17% in IT spending over the next five years. The big need, according to the respondents, is networking equipment and software to link together in-place hardware. The importance of networked systems is heightened by the continuing consolidation in the industry and the emergence of super-regional banks that mandate connecting regional offices. Furthermore, the steady erosion of regulations, which separate banking and securities practices, is creating new market opportunities for banking automation software vendors.

By Madeline Franchi. For more information on Cahners Economics's forecasting services, call Dan Buchan at (617)-630-2105.

IT Accounts For Bank Productivity



Banks Rate The Importance Of Networks



The Economy At A Glance

U.S. Economy: Macroeconomic And Industrial Indicators

	Actual			Forecast	
	Q4/91	Q1/92	1992	1993	1994
Gross Domestic Product	0.4	2.7	2.1	2.6	2.0
Business Investment in Equipment	-1.6	3.5	2.1	4.6	4.2
Government Spending	-5.4	2.9	-2.3	-3.7	-0.1
Consumer Spending	0.0	5.0	2.6	2.8	1.9
Exports	9.7	2.5	5.9	7.5	6.5
Imports	2.1	1.5	4.8	3.5	3.2

All calculations are % change in 1987 dollars; quarterly figures are seasonally adjusted annual rates

	May 1992	April 1992	% Change 5/92-4/92	May 1991	% Change 1991-1992
Manufacturing Production (1)					
Process Industries Total	109.6	109.5	0.1	104.4	4.9
Chemicals	115.6	115.3	0.3	109.2	5.9
Petroleum	110.0	110.4	-0.4	107.5	2.3
OEM Total	111.2	109.6	1.5	109.3	1.8
Computers & Peripherals	170.0	168.2	1.1	155.6	9.3
Communication Equipment	111.3	111.0	0.3	113.0	-1.5
Transportation Equipment	99.8	98.0	1.8	98.2	1.6
Services Employment (2)					
Finance, Insurance, Real Estate	6.688	6.654	0.5	6.681	0.1
Health Care	8.414	8.394	0.2	8.109	3.8
Computer & Data Processing	.809	.811	-0.3	.786	2.9
Transportation/Utilities	5.744	5.705	0.7	5.767	-0.4
Retail Trade	19.118	18.909	1.1	19.258	-0.7
Wholesale Trade	5.990	5.968	0.4	6.079	-1.5
Government	18.937	18.899	0.2	18.752	1.0

(1) Index 1987 = 100; seasonally adjusted

(2) Millions of persons; not seasonally adjusted

Source: Commerce Dept., Cahners Economics

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A CAHNNERS PUBLICATION

DATA[®]MATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

Ellen M. Hancock,
vice president and general
manager, networking
systems, IBM



OCTOBER 1, 1992

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Enterprise Networking:**

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MANAGEMENT

ECONOMIC TRENDS

Trudging Toward Recovery

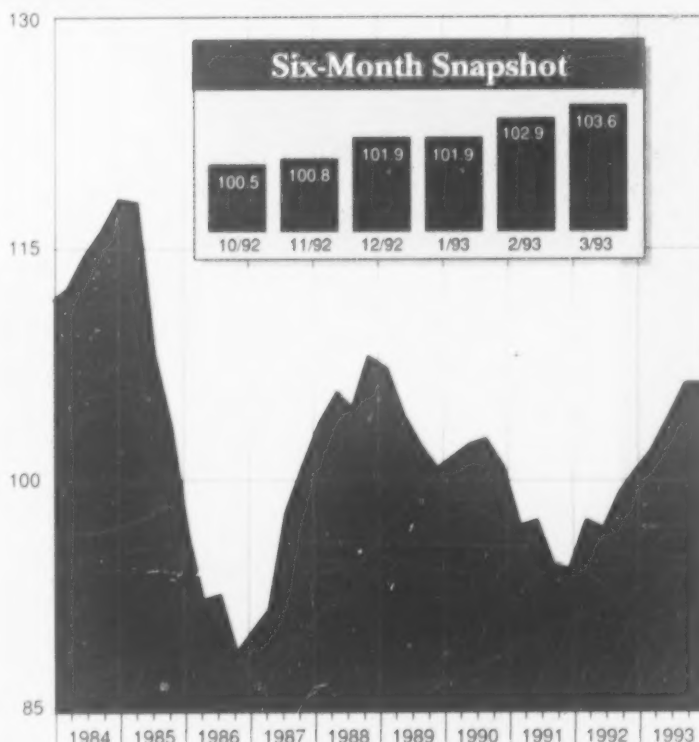
The recent mild upswing in the economy is producing a noticeable and positive effect on the information technology industry. After four straight quarters of flat growth or out-and-out painful losses, new orders for computers, peripherals and communications equipment increased 8.9% in the first period of this year and 12.4% in the second quarter from their levels a year ago. Our forecast for a 14% spurt in the third quarter is easily within range. The industry hasn't witnessed such quarterly growth in two-and-a-half years.

This resurgence in orders is pushing up DATAMATION's Information Systems Performance Indicator (ISPI). In June, the ISPI, which tracks the overall health and performance of the IT industry, hovered just below 100—the demarcation line between decline and growth. Cahners Economics estimates the ISPI will move to 100.5 in October, indicating that growth has begun.

The IT industry is now savvy and mature enough not to get euphoric over the latest jump in demand. The IS sector is still billing more than it's booking, so the climb out of the recessionary hole won't be an easy one. But we predict that the economic recovery will persevere, boosting the ISPI to 106.2 by this time next year.

By Madeline Franchi. For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617)-630-2105, send him a fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington Street, Newton, MA 02158.

The IS Performance Indicator



*Shaded area denotes forecast

Source: DATAMATION, Cahners Economics

	Last Month	Prev. Month	% Change	Year Ago	% Change
■ Information-Processing Equipment					
Shipments (SA, \$ billions, June)	9.53	9.06	5.1	8.2	16.2
New Orders (SA, \$ billions, June)	9.41	9.01	4.4	8.10	16.2
Unfilled Orders (SA, \$ billions, June)	19.00	19.11	-0.6	21.97	-13.5
Inventory (SA, \$ billions, April)	16.20	19.23	-15.8	16.66	-2.8
■ Computer Production Workers					
Employment (NSA, thousands, June)	242.3	244.1	-0.7	260.5	-7.0
Average Weekly Hours (monthly avg., June)	40.8	40.7	0.2	41.9	-2.6
■ Stock Index (July)					
S&P's Computer Systems Stock Price Index	153.8	150.3	2.3	164.6	-6.5
■ Contracts & Orders (May)					
New Plant & Equipment (SA, \$ billions)	33.27	34.85	-4.5	31.14	6.8

SA = Seasonally Adjusted
NSA = Not Seasonally Adjusted

Source: U.S. Commerce Dept., Standard & Poor's

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DATA MATION®

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

OCTOBER 15, 1992

Tom McLean,
vice president,
Systems Software division,
Cincom Systems Inc.,
with Supra 3.0



Mainframe DBMS Power Unleashed!

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With UNIX** page 65

*Apple's DAL Takes On
New AS/400 Roles*
page 72

**Are You Ready For Cutting
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DATA MATION
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FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

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26 Mainframe DBMS Power Unleashed!

Cincom's new Supra 3.0 distributed RDBMS is getting high marks initially from IS. But can Cincom capitalize on its strengths?

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After two years in development, Computer Associates has announced version 3.0 of Masterpiece, its integrated, modular accounting package.

118 Geographic Databases Go Relational

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120 Gateway To An Enterprise Future

LAN-to-SNA links offer a migration path from quick and dirty terminal emulation to advanced cooperative applications.

PCs & WORKSTATIONS

65 Downsize Your Database With UNIX

When building industrial strength client/server applications, nothing quite beats running UNIX on a server with attached PCs. At least not yet.



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COBOL is on the move. Now it does UNIX, OOPS, Windows and more. And it's rolling fast for the year 2000.

87 Managing The Move From Midrange To Client/Server

Here's how business applications vendor Ross Systems Inc. is porting its Digital VAX-only software to UNIX and NT client/server systems.

MIDRANGE/MAINFRAME

97 Real-Time Will Get Real Standards

Forthcoming extensions to POSIX promise to discipline the unruly real-time marketplace and may push real-time systems into commercial IS.

MANAGEMENT

108 DoD's Strassmann: The Politics Of Downsizing

In many ways, the Department of Defense's IT organization is like yours—it's just a little bit bigger. The DoD's 1993 IT budget will be over \$9 billion on the noncombat side alone.

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IT Keeps On Trucking

Information technology has joined the trucking industry for the long haul. The need to monitor packages, track vehicles and coordinate just-in-time deliveries is forcing the adoption of IT in this industry.

According to estimates of the U.S. Department of Commerce, the motor carrier industry attained revenues of \$285 billion in 1991, 4.4% higher than the previous year, employing at least 1.52 million people. Revenues are projected to grow 7% more in 1992, even with intense competition squeezing trucking rates and a sluggish economic recovery.

Based on interviews with 1,800 IS executives in 23 industries, DATAMATION sister organization Business Research Group predicts that IS budgets in the transportation services sector will advance just 2% this year. However, requirements in the trucking industry may force outlays for real-time information systems for the transportation industry to balloon.

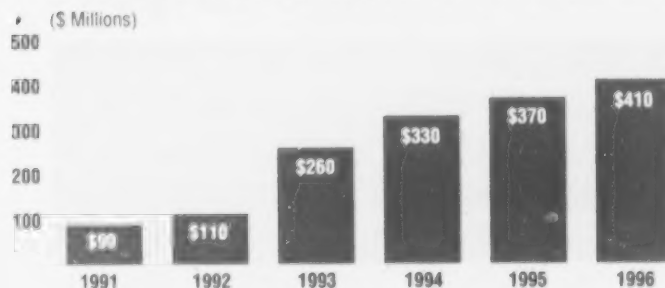
Venture Development Corp., a market research firm in Natick, Mass., projects that shipments of real-time IS gear to the trucking industry alone will more than double from \$1.2 billion in 1991 to \$2.8 billion in 1993, while shipments of such equipment to the transportation industry at large are projected to increase 65% to \$4.8 billion.

In particular, trucking companies are improving voice and data communications with truck drivers. Today, that number has climbed to 30,000. Venture Development estimates that in 1991 trucking companies used \$90 million worth of wireless network services. Usage is expected to top \$400 million by 1996. In the next few years, wireless communications will combine satellite, radio frequency and digital cellular networks to provide advanced data, voice, location and vehicle status information. ■

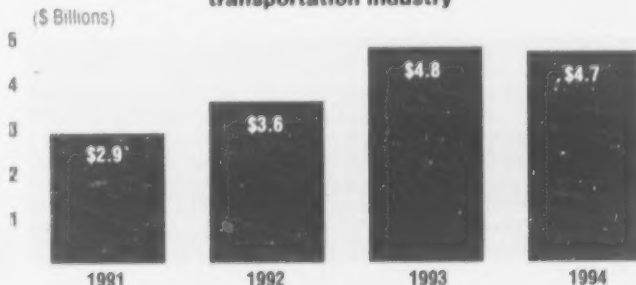
By Madeline Franchi, Cahners Economics. For more information on Cahners Economics' forecasting services, call Dan Buchan at (617)-630-2105.

Transportation Makes Waves

Purchases of wireless services by the U.S. trucking industry



Total shipments of real-time systems to the U.S. transportation industry



Source: Venture Development

The Economy At A Glance

U.S. Economy: Macroeconomic And Industrial Indicators

	Q1/92	Actual Q2/92	1992	Forecast 1993	1994
Gross Domestic Product	2.9	1.4	2.0	3.2	2.3
Business Investment In Equipment	3.2	20.7	5.5	5.8	4.9
Government Spending	1.7	0.3	-0.9	-1.5	-0.9
Consumer Spending	5.1	-0.3	2.9	2.9	2.1
Exports	2.9	-3.8	5.5	7.6	6.5
Imports	3.5	6.3	5.7	3.0	2.7

All calculations are % change in 1987 dollars; quarterly figures are seasonally adjusted annual rates.

	June 1992	May 1992	% Change 6/92-5/92	June 1991	% Change 1991-1992
Manufacturing Production (1)					
Process Industries Total	110.9	110.1	0.7	105.5	5.1
Chemicals	118.0	116.9	0.9	109.6	7.7
Petrochemical	109.1	108.7	-0.4	109.6	-0.5
OEM Total	110.8	111.4	-0.6	109.9	0.8
Computers & Peripherals	174.0	170.5	2.1	154.0	13.0
Communication Equipment	112.6	112.3	0.3	112.2	-0.4
Transportation Equipment	98.0	99.6	-1.6	99.7	-1.7
Services Employment (2)					
Finance, Insurance, Real Estate	6.739	6.680	0.9	6.742	0.0
Health Care	8.482	8.420	0.7	8.189	3.6
Computer & Data Processing	.817	.809	0.9	.791	3.2
Transportation/Utilities	5.769	5.741	0.5	5.795	-0.4
Retail Trade	19.323	19.131	1.0	19.432	-0.6
Wholesale Trade	6.029	5.993	0.6	6.109	-1.3
Government	18.659	18.923	-1.4	18.483	1.0

(1) Index 1987 = 100, seasonally adjusted
(2) Millions of persons, not seasonally adjusted

Source: Commerce Dept., Cahners Economics

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